1987

Joint Evaluation of

Salinity Control Programs

in the

Colorado River Basin

1987 JOINT EVALUATION OF SALINITY CONTROL PROGRAMS IN THE COLORADO RIVER BASIN

December 1987

Prepared by

Colorado River Water Quality Office
Bureau of Reclamation

and the
USDA Salinity Control Coordinating Committee
U. S. Department of Agriculture

in cooperation with
Bureau of Land Management,
Geological Survey, Fish and Wildlife Service,
and the Environmental Protection Agency

Contents

Tables

Figures

Appendices

FOREWORD

Nothing in this report is intended to interpret the provisions of the Colorado River Compact (45 Stat. 1057), the Upper Colorado River Basin Compact (63 Stat. 31), the Water Treaty of 1944 with the United Mexican States (Treaty Series 994, 59 Stat. 1219), the decree entered by the Supreme Court of the United States in Arizona vs. California, et al. (376 U.S. 340), the Boulder Canyon Project Act (45 Stat. 1057), the Boulder Canyon Project Adjustment Act (54 Stat. 774; 43 U.S. Code 618a), the Colorado River Storage Project Act (70 Stat. 105; 43 U.S. Code 620), or the Colorado River Basin Project Act (82 Stat. 885; 43 U.S. Code 1501).

1987 JOINT EVALUATION OF SALINITY CONTROL PROGRAMS IN THE COLORADO RIVER BASIN

This summary report and appended materials are a combined Department of the Interior and Department of Agriculture effort to fully coordinate and integrate the respective salinity control programs authorized in Public Law 98-569, amendments to the Colorado River Basin Salinity Control Act of 1974 (Public Law 93-320). Units under both programs are shown in figure 1. Data for all units reflects accomplishments to January 1, 1987.

The triennial 1987 Review, Water Quality Standards for Salinity, Colorado River System, contains a summary of agency and unit activities and most of the information gathered during the 1987 joint evaluation. This report does not duplicate that material. The 1987 Review was prepared by the Colorado River Basin Salinity Control Forum (Forum) and copies may be obtained by writing Jack A. Barnett, Executive Director, Colorado River Basin Salinity Control Forum, 106 West 500 South, Suite 101, Bountiful, Utah 84010. The appended materials contain the basic data tables and much of the basic information used in the 1987 analysis.

BACKGROUND AND ASSUMPTIONS

The 1987 evaluation was prepared using updated and adjusted data to more accurately compare the program information of the Department of the Interior and the Department of Agriculture. All costs were updated to January 1987 and interest or discount rates (8 7/8 percent) have been adjusted to the same base. Repayment analysis for the Lower Colorado River Basin Development Fund was based on the current 1987 rate of 7 1/2 percent interest rate for the years 1987 and beyond.

The base condition for the CRSS (Colorado River Simulation System) computer model evaluation assumes no funds expended on salinity control beyond those already spent on Grand Valley, Meeker Dome, Uinta Basin, and Las Vegas Wash. These projects, or portions thereof, are currently removing approximately 141,000 tons of salt annually from the river system. Projections of future salinity conditions used the average of 15 sequences of historical hydrology (1906-1983) as a data base and current (1987) depletion projections developed jointly by Reclamation and the Forum.

The salinity at Imperial Dam is projected to reach about 960 mg/L by the year 2010. Figure 2 provides an historical perspective in addition to the numeric standard and the projections at Imperial Dam. It is readily apparent that without the recommended controls, the salinity at Imperial Dam is expected to increase significantly over the next eight years due in part to expected normal hydrologic conditions. Using the salinity projections at Imperial Dam, salt load reductions required to reduce projected TDS (total dissolved solids) levels to the numeric criteria of

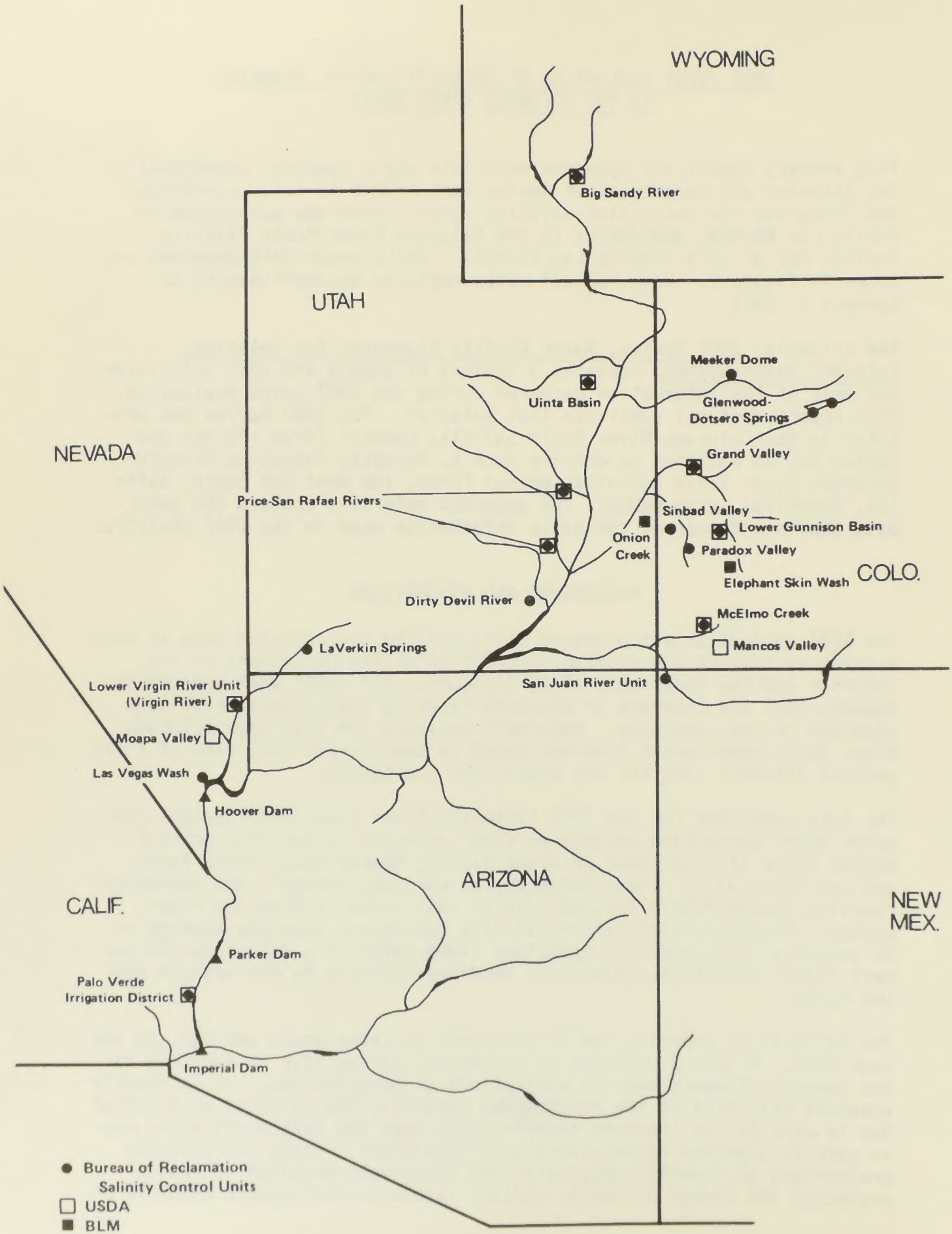


Figure 1. Colorado River Basin salinity control projects.

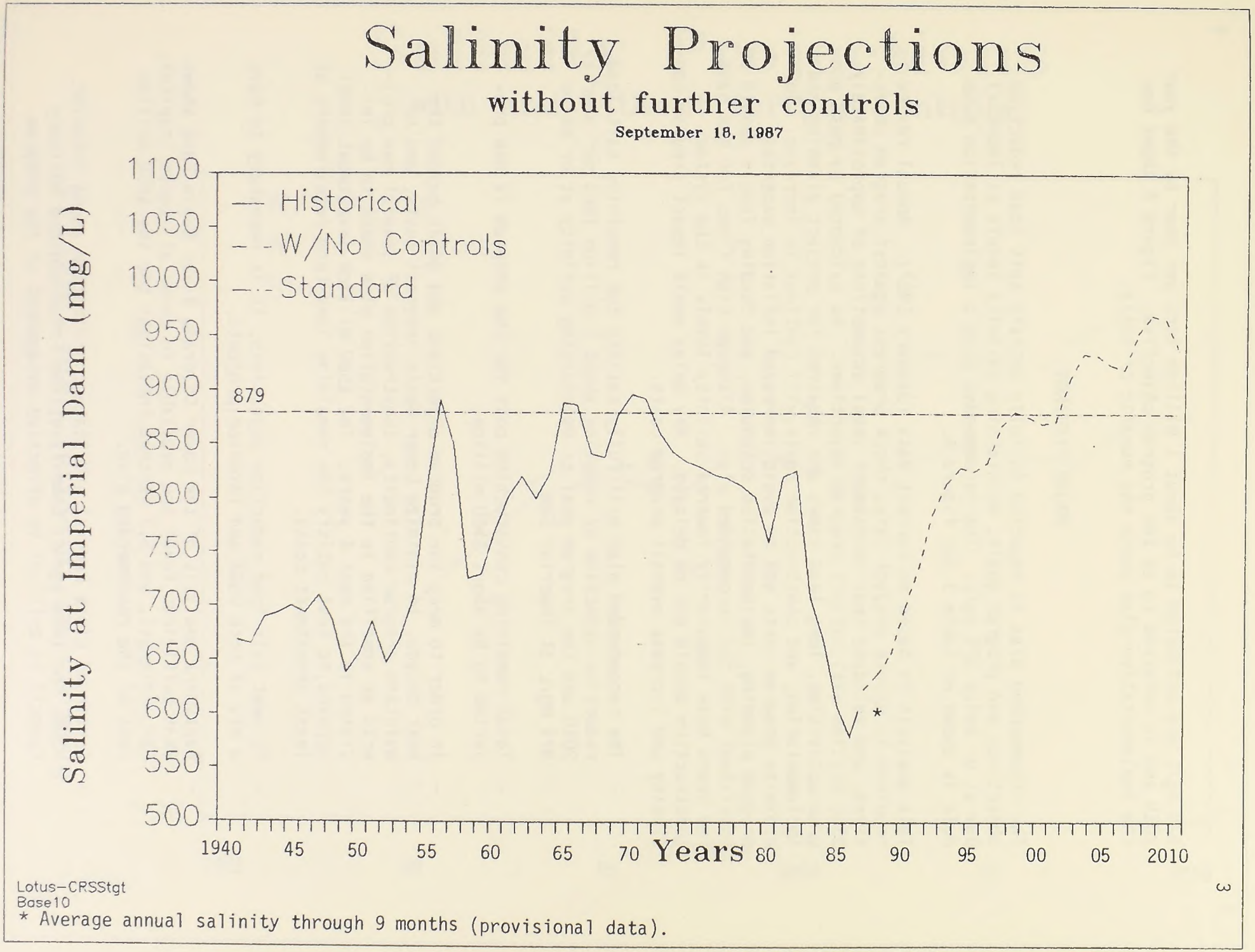


Figure 2. Salinity projections at Imperial Dam without further controls.

879 mg/L are estimated to be about 1 million tons per year by the year 2010 and is referred to as the program objective. Figure 3 shows how the implementation plan meets the numeric criteria.

MAJOR FINDINGS

The recommended plan is expected to fully satisfy salt load reduction objectives and program goals, maintaining salinity levels at Imperial Dam at or below 879 mg/L. The recommended plan's implementation schedule is shown on table 1 and figure 4.

This analysis is based on current data (January 1987). Annual review is required to update project data, check progress against program objectives, and validate that investment level assumptions of approximately $560 million will satisfy program objectives. As evidenced by past program activities, long lead times are required for project planning and implementation, and construction costs will continue to increase. To minimize program costs and to avoid increased inflation expenses, program planning, implementation schedules, and funding levels should be consistent with the recommended plan. Although high flows for the past few years have temporarily lowered salinity levels in the system, construction should not be delayed. Any delay would impact program continuity and increase overall program costs.

- The recommended plan will fully satisfy the remaining salt load reduction objective of removing about 1 million tons per year by 2010 and the program goal of maintaining salinity at or below 879 mg/L at Imperial Dam.

- Total remaining construction cost for the program is now projected to be about $560 million.

- In order to meet the program objectives and goals beyond the next decade, to minimize Lower Basin interest costs, and to maintain program continuity, construction of several new projects as specified in the implementation plan needs to be initiated in the next 4 years. The $560 million investment level appears to best satisfy the remaining long-term requirements at least investment costs.

- To meet salt load reduction objectives, it is necessary to have a mix of both USDA and Interior projects.

- Repayment analysis of the Lower Colorado River Basin Fund shows that sufficient funds are available to cover all costs (capital, O&M, interest, and 5.3 percent inflation) for the $560 million cost of the recommended plan.

- Continued close Federal and State coordination among Interior, USDA, the Interagency Committee, the Forum, and the Advisory Council is critical to effective management of the program.

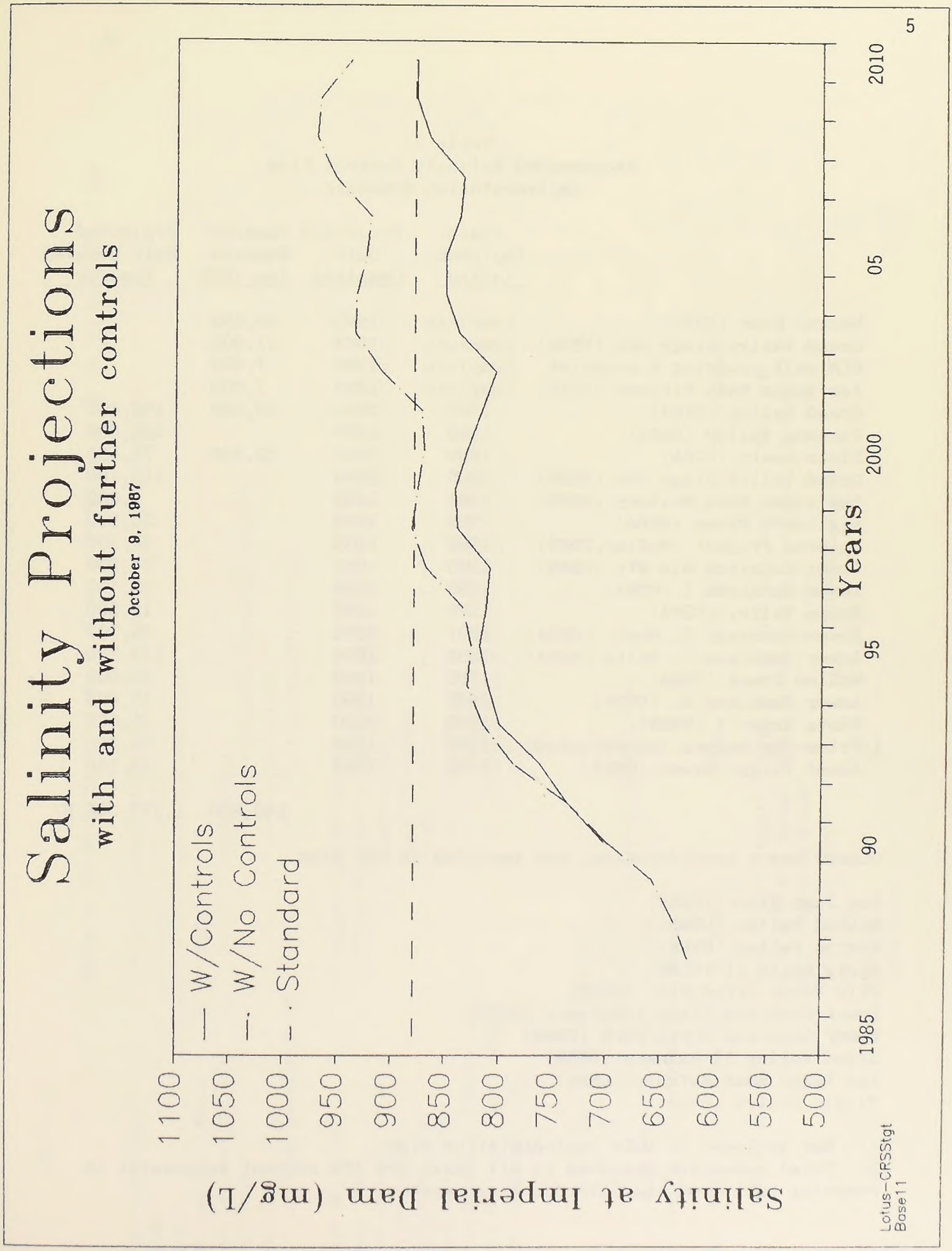


Figure 3. Salinity projections at Imperial Dam with and without further controls.

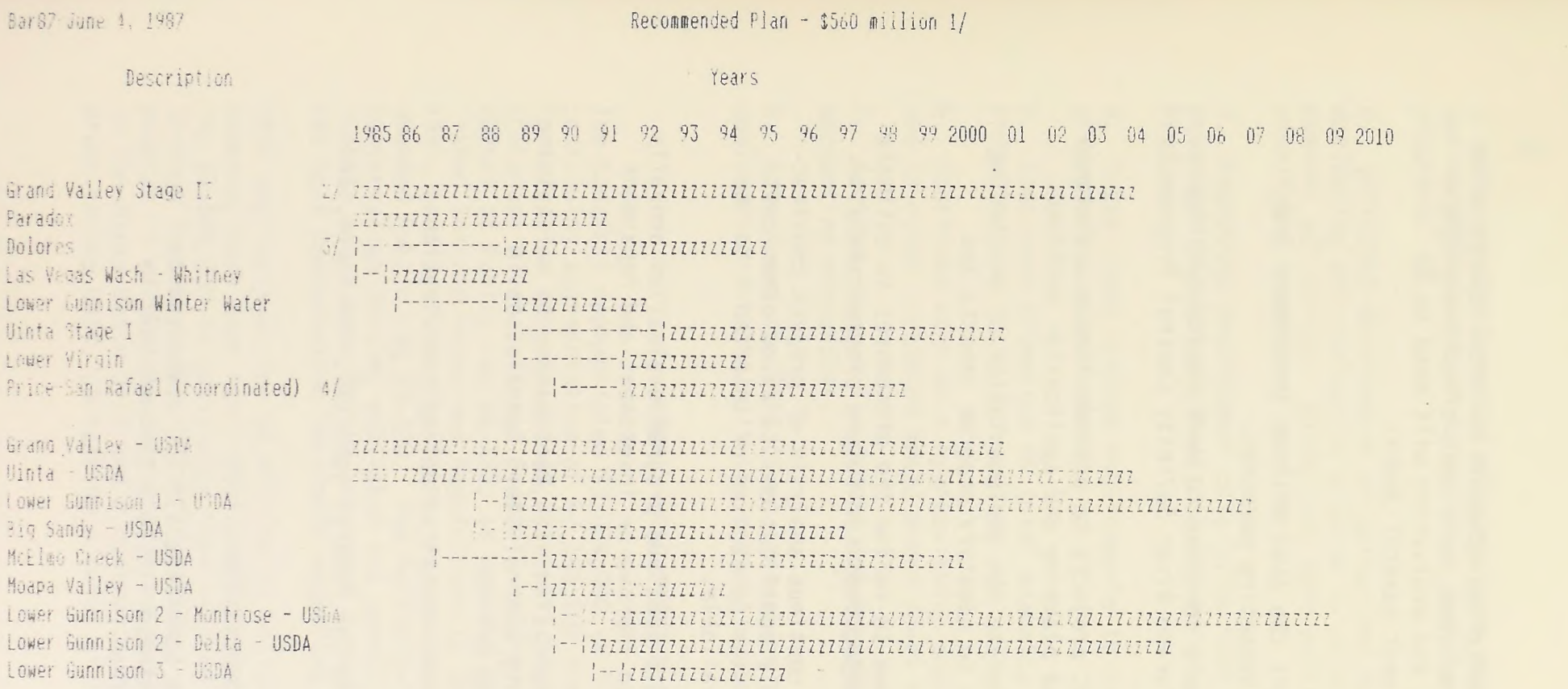
Table 1
Recommended Salinity Control Plan
Implementation Schedule

	Begin Implementation	Projected Date Complete	Tons/yr Removed Jan 1987	Projected Salt Removed Tons/yr
Meeker Dome (USBR)	Complete	1983	48,000	
Grand Valley Stage One (USBR)	Complete	1984	21,900	
BLM well plugging & nonpoint	Complete	1986	7,600	
Las Vegas Wash Pittman (USBR)	Complete	1985	7,000	
Grand Valley (USDA)	1979	2000	33,600	196,400
Paradox Valley (USBR)	1980	1990		180,000
Uinta Basin (USDA)	1980	2003	22,700	75,500
Grand Valley Stage Two (USBR)	1985	2003		113,100
Las Vegas Wash Whitney (USBR)	1986	1988		1,000
Big Sandy River (USDA)	1989	1996		52,900
Dolores Project (McElmo,USBR)	1989	1994		24,500
Lower Gunnison Win Wtr (USBR)	1989	1991		74,000
Lower Gunnison 1 (USDA)	1989	2006		82,100
Moapa Valley (USDA)	1990	1993		19,500
Lower Gunnison 2, Mont. (USDA)	1991	2008		81,700
Lower Gunnison 2, Delta (USDA)	1991	2004		104,700
McElmo Creek (USDA)	1990	1999		38,000
Lower Gunnison 3, (USDA)	1992	1995		12,000
Uinta Basin I (USBR)	1993	2000		25,500
1/Price-San Rafael (Coordinated)	1992	1998		52,300
Lower Virgin River (USBR)	1992	1994		44,100
			140,800	1,177,300 2/

Others under consideration, not included in the plan.

San Juan River (USBR)
Sinbad Valley (USBR)
Mancos Valley (USDA)
Uinta Basin II (USBR)
Palo Verde Irrig Dist (USBR)
Lower Gunnison Stage I Balance (USBR)
Lower Gunnison North Fork (USBR)
Grand Valley II Balance (USBR)
Las Vegas Wash Balance (USBR)
Virgin Valley (USDA)

1/ Not included in USDA implementation plan.
2/ Total reduction achieved if all units are 100 percent successful in removing salt from the Colorado River system.



1/ Information based on 1987 data tables.
2/ 2's zzzzz designate construction activities.
3/ Lines |------| designate advance planning activities for Reclamation and technical assistance activities for USDA.
4/ Currently not included in USDA Schedule.

Note: Units not currently in plan:

Reclamation:	USDA:	Deferred:	Completed Units:
Grand Valley II, Balance	Virgin Valley	Dirty Devil River	Meeker Dome
Lower Gunnison I, Balance	Mancos Valley	*Palo Verde Irrig Dist	Grand Valley Stage I
*Lower Gunnison North Fork		*Big Sandy	Las Vegas Wash - Pittman
Las Vegas Wash Stage II		Glenwood-Dotsero Sprgs	
*Uinta Stage II			
*San Juan			
Sinbad Valley			

*Data not available

Figure 4. Recommended salinity control plan implementation schedule.

- To keep the project implementation schedule on track and to allow for inclusion of newly formulated, more cost-effective projects and changes in technology, the evaluation will need to be reviewed annually for the next several years.

Management Recommendations

- DOI and USDA should support the $560 million investment level for program planning and budgeting purposes.

- All involved agencies should continue to work toward full implementation of the USDA Colorado River Salinity Control Program in coordination with DOI.

- USDA should staff the CRSC projects to provide timely assistance and to maintain a balanced planning and application workload.

- USDA and DOI should accelerate the implementation of monitoring and evaluation activities to quantify program impacts and accomplishments.

- Reclamation should continue to refine the procedures to estimate the salt load reduction objectives for future program analysis.

- Involved agencies should continue analysis of project construction schedules for possible modifications to allow other cost-effective projects to be started earlier or inserted into the program as new data is available.

- Reclamation and USDA should continue program evaluation annually to monitor progress and to improve on investment and repayment analysis.

- USDA should continue coordination with Reclamation by maintaining the Colorado River Salinity Control Basin Coordinator in Reclamation's coordinating office.

- Continue the SCS/Reclamation technical policy coordination committee activities.

- Continue cooperation among the Federal agencies, the Forum, and the Advisory Council.

PROGRAM COORDINATION - TPCC

The Technical Policy Coordinating Committee (TPCC), organized by Reclamation and SCS in 1985, continued its role through 1987 by addressing the following activities:

1. Developed a schedule of activities needing to be performed by USDA and by USBR personnel to maintain near-term construction program progress.

2. Initiated development of guidelines for planning and conducting a monitoring and evaluation program to assess effectiveness of salinity control activities. Guidelines were published and distributed for use within the respective agencies.

3. Requested development of a joint USBR/SCS process for reporting the salt load reduction effects of the Dolores/McElmo Creek Salinity Control Project.

4. Established minimum requirements to facilitate common USDA reporting of project accomplishments.

5. Continued promotion of joint planning for the Price-San Rafael Project.

6. Continued work on a hydrosalinity model for use in Lower Gunnison and in other irrigated areas where joint programs are underway.

7. Refined program investment and repayment analysis and Basin fund accounting procedures.

8. Introduced the FIRI (Farm Irrigation Rating Index) for use and application in USDA salinity control areas.

USDA'S CRSC PROGRAM ACTIVITIES

The Congress appropriated $3,804,000 in Fiscal Year 1987, along with a continuing appropriation of $2,196,000 from ACP (Agricultural Conservation Program) funds, to initiate the USDA's voluntary CRSC (Colorado River Salinity Control) onfarm program authorized by Section 202(c) of Public Law 93-320, as amended (43 USC 1592(c)). USDA published Interim Rules and Regulations in the Federal Register on May 5, 1987, setting forth the terms and conditions for implementing the amended Public Law 93-320. The Agricultural Stabilization and Conservation Service published its operating procedures for administering the program on May 13, followed by publication on May 26, 1987, of the Soil Conservation Service's operating procedures for the program.

CRSC applications for $4 million in assistance on which planning is underway have been received from 56 producers in the Uinta Basin and for $1,500,000 in assistance from 47 producers in the Grand Valley Unit through September 30, 1987. Implementation of the USDA voluntary program is underway with the signing of 12 contracts totaling $566,000 in the Uinta Basin Unit and 3 contracts for about $172,000 in the Grand Valley Unit, obligating a total of $738,000 in Federal funds.

As a result of cost-share expenditures paid under the new CRSC program in Fiscal Year 1987, a Basin Fund repayment debt has been incurred. Expenditures of $82,113 in the Uinta Basin and $26,894 in the Grand Valley, totaling $109,007, result in a $27,797 repayment obligation for the Lower Basin Development Fund and $4,905 for the Upper Basin Fund.

Uinta Basin CRSC Signing Ceremony

Seventy individuals representing Federal, State, and local agencies; private landowners and irrigation company representatives attended a special first contracts signing ceremony at Roosevelt, Utah, on July 2, 1987, which obligated $434,918 of Colorado River Salinity Control (CRSC) federal cost-share assistance funds. Nine contracts were signed by local officials which provide onfarm irrigation system improvements to 1,528 acres of farmland. When salinity reduction practices (SRP's) are installed and irrigation water management is applied, these systems will provide an estimated 1,484 tons annual salt load reduction to the Colorado River system.

Participants in the ceremony included Wilson Scaling, Chief, Soil Conservation Service; Vern Neppl, Associate Administrator, Agricultural Stabilization and Conservation Service; Tom Holback, National Program Leader, Cooperative Extension Service; Howard A. Nielson, U. S. Congressman, Utah; Jack Barnett, Executive Director, Colorado River Salinity Control Forum; and Calvin Sudweeks, Director, Bureau of Water Pollution Control, Utah Department of Health.

EIS Process - Big Sandy Unit, Wyoming

On October 17, 1986, the Wyoming State Office of the SCS announced intentions to prepare an Environmental Impact Statement on the Big Sandy Unit of the Colorado River Salinity Control Program. Scoping meetings were conducted in the project area during October and November 1986. Participants in these meetings included the EPA, BLM, Wyoming State Engineer's Office, Wyoming Department of Environmental Quality, Wyoming Game and Fish Department, and landowners from the project area. Agencies cooperating in development of the EIS included the ASCS, CES (Cooperative Extension Service), Wyoming State Engineer's Office, Wyoming Department of Environmental Quality, Wyoming Game and Fish Department, and the Wyoming Conservation Commission.

A preliminary draft EIS was distributed for review and comment prior to developing the draft EIS. The formal draft EIS was distributed for review on February 27, 1987. The comment period, extended 15 days, closed on May 12, 1987. After consideration and incorporation of the review comments, the final EIS was distributed in late 1987.

USDA Operating Procedures Workshops

To introduce USDA agency personnel to their duties and responsibilities for program implementation, and to facilitate agency cooperation and coordination during program implementation, the USDA jointly conducted inter-agency workshops. Personnel at the project level were trained in agency duties and responsibilities as published in rules and regulations and in USDA operating procedures developed to guide project implementation. The two-day workshops were held at Roosevelt, Utah, for the Uinta Basin Unit and at Grand Junction, Colorado, for the Grand Valley, the Lower Gunnison, and the McElmo Creek units. Participants included representatives from the ASCS and the ASC County Committees, from the SCS and the local Soil Conservation Districts, from water user groups, and others.

Biology Workshop

To strengthen personnel awareness and to emphasize the importance of voluntarily preserving, protecting, or replacing fish and wildlife values in the onfarm program, the USDA held a biology workshop at Grand Junction, Colorado, in September. ASCS and SCS personnel from Utah, Wyoming, Nevada, and Colorado participated in the three-day workshop. Legislative requirements for including biological considerations in the program, as further described in program rules and regulations and in agency operating procedures, were reviewed in detail. Working in field situations, participants examined salinity control practices that adversely impact habitat values and they applied methods for evaluating the magnitude of those impacts. Opportunities for identifying and installing practices which provide for the voluntary replacement of habitat values were identified and demonstrated under field conditions by workshop participants.

BUREAU OF RECLAMATION ACTIVITIES IN 1987

As stated earlier, the status of the units was included in the triennial review and, thus, are not being repeated here; however, a few of the major accomplishments are noted.

Paradox Valley Unit, Colorado

Drilling operations have been successfully completed to a depth of about 16,000 feet. All coring and casing installations have also been completed. A contract for the brine pipeline which will transport Paradox brine to the injection test well was awarded September 17, 1987, for the amount of $1,600,000. Surface treatment facilities and injection facilities to be used in conjunction with the brine pipelines will be constructed under separate contract. The special alloy injection string has been ordered with delivery expected about mid-1988.

Grand Valley Unit, Colorado

The membrane lining of West End Government Highline Canal was half completed by April 6 when water was turned into the canal. The contract for the West End Government Canal, Stage Two, was 87 percent complete at the end of September.

Lower Virgin River Unit, Nevada

Recent investigation shows that a total of 48,200 tons of salt could be removed from the river system, with a cost-effectivenss of about $66 per ton. The 48,200 tons includes 25,700 tons attributed to AWT (advanced water treatment) flows, the proposed Harry Allen Power Plant alternative water supply. Cost-effectiveness of $66 per ton is based on the net reduction of this project of 22,500 tons.

Because of proposed budgetary cuts in FY-88, the date for completing the Planning Report/Draft Environmental Statement is uncertain.

Saline Water Use and Disposal Opportunities Unit

A memorandum report covers IX (ion-exchange) work done at the Southern California Edison, Etiwanda power generating station during the fall of 1986 and early spring of 1987. The report confirms that IX softening of cooling tower make-up feed water, using cooling tower blowdown as the sole regenerant, is practical. Because of early cutoff of testing due to budget considerations, not all objectives were achieved. One of the original objectives was to test the process on the potential feed water for the proposed Harry Allen Power Plant in southern Nevada. Also planned were tests on a vertical tube evaporator to further concentrate the regenerant brines and tests to evaluate any possible corrosion effects resulting from the IX process.

The results of this study provide a major advance in using ion exchange softening of saline water for use in powerplant cooling.

Appendix A

Data Tables

	USBR Sinbad Valley	BR Meeker Dome	BR Grand Valley Stage One
	COLORADO	COLORADO	COLORADO
Date of Estimate:	1/82	Completed	Completed
Interest Rate:	7.63		
Estimate Adjustment for 1/87:	108.11%		
1/87 Interest Rate	8.88		
IDC Adjustment for 1/87:	16.32%		
Project Area			
1. Irrigated Area (total acres)			6,000
2. Potential Participants:			
a. Individuals (number)			
b. Groups (number)			
3. Canals (total miles)			
4. Laterals (total miles)			
5. Point Sources (number)	1	3	
6. Other			
Salt Load Contribution			
1. On-farm (tons/year)			
2. Canals (tons/year)			
3. Laterals (tons/year)			
4. Point Sources (tons/year)	8,938	57,000	
5. Other (tons/year)			
Implementation Plan			
1. Construction Start (year)	1991		1980
2. Construction Period (years)	3		3
3. Expected Participants:			
a. Individuals (number)			
b. Groups (number)			
4. On-farm Practices:			
a. Treated Area (acres)			
b. Land Leveling (acres)			
c. Sprinkler Systems (acres)			
d. Farm Ditches/Pipelines (miles)			
5. Canal Lining (miles)			6.70
6. Lateral Lining (miles)			
7. Pipe Laterals (miles)			29.7
8. Winter Water Systems (miles)			
9. Collection Features (type)	low dam		
10. Delivery Systems (type)	pipeline		
11. Disposal Facilities (type)	deep well inj	well plugs	
12. Habitat Replacement (acres)			
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)			
b. Canals (tons/year)			21,900
c. Laterals (tons/year)			
d. Point Sources (tons/year)		19,000	
e. Other (tons/year)			
2. Potential/Balance:			
a. On-farm (tons/year)			
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)	7,470		
e. Other (tons/year)			
Data Source:	9/82 BLM Rpt	7/85 Clc Rpt	1986 EIS

	BLM Sinbad Valley	BR Meeker Dome	BR Grand Valley Stage One
	COLORADO	COLORADO	COLORADO
Economic and Financial Analyses			
Department of the Interior:			
1. Plan Formulation Costs		3,118,000	
2. Nonsalinity Planning Costs			
3. Advance Planning Costs:			
a. Prior to Authorization			25,000
b. After Authorization	500,000		
4. Nonsalinity Design Costs			
5. Salinity Const. Costs To Date			27,744,000
6. Balance Salinity Const. Costs	7,233,514		
7. Nonsalinity Construction Costs			
8. Habitat Replacement Costs			
9. Salinity IDC:			
a. Economic	311,806		1,112,000
b. Financial			
10. Nonsalinity IDC			
a. Economic			
b. Financial			
11. Salinity OM&R Costs w/o Power	54,054		104,000
12. Nonsalinity OM&R w/o Power			8,000
13. Economic Cost of Power			
14. Financial Cost of Power	9,405		
15. Salinity M & E Costs			
16. Nonsalinity M & E Costs			
Department of Agriculture:			
1. Technical Assistance Costs			
2. M & E Costs			
3. Information and Education Costs			
4. Federal Cost-share Obligations			
5. Federal Const. Cost-share To Date			
6. Balance Federal Const. Cost-share			
7. Local Construction Cost-share			
8. Percent Federal Cost-share:			
9. Federal Habitat Costs			
10. Local Habitat Costs			
11. Other Local Costs			
12. Local O&M Costs			
13. Annual Value of Replacement Costs			
14. Federal IDC			
Cost Effectiveness:			
1. Total Salinity Construction Costs	7,233,514	3,118,000	27,744,000
2. Advance Planning Costs	500,000		
3. Habitat Replacement Costs			
4. IDC (Economic)	311,806		1,112,000
5. Investment Cost	8,045,320	3,118,000	28,856,000
6. Annual Equivalent Investment Costs	705,172	273,293	2,529,228
7. Annual Salinity OM&R Costs	54,054		104000
8. Annual Economic Cost of Power	9,405		
9. Annual M & E Costs			
10. Annual Habitat OM&R Costs			8000
11. Annual Salinity Costs	768,632	273,293	2,641,228
12. Tons of Salt Removed Annually	7,470	19,000	21,900
13. Cost Effectiveness - $/ton	103	14	121

	BR Grand Valley Stage Two COLORADO	BR Grand Valley Stage Two Balance COLORADO	USDA Grand Valley COLORADO
Date of Estimate:	1/85	1/85	10/79
Interest Rate:	8.63%	8.63%	7.08%
Estimate Adjustment for 1/87:	102.56%	102.56%	
1/87 Interest Rate	8.88%	8.88%	8.88%
IDC Adjustment for 1/87:	2.84%	2.84%	
Project Area			
1. Irrigated Area (total acres)	45,270	8,730	66,000
2. Potential Participants:			
a. Individuals (number)			920
b. Groups (number)			250
3. Canals (total miles)			
4. Laterals (total miles)			190
5. Point Sources (number)			
6. Other			
Salt Load Contribution			
1. On-farm (tons/year)			300,000
2. Canals (tons/year)			
3. Laterals (tons/year)			100,000
4. Point Sources (tons/year)			
5. Other (tons/year)			
Implementation Plan			
1. Construction Start (year)	1985	1996	1979
2. Construction Period (years)	19	9	22
3. Expected Participants:			
a. Individuals (number)			920
b. Groups (number)			250
4. On-farm Practices:			
a. Treated Area (acres)			53,000
b. Land Leveling (acres)			16,900
c. Sprinkler Systems (acres)			800
d. Farm Ditches/Pipelines (miles)			1,790
5. Canal Lining (miles)	31.86	6.14	
6. Lateral Lining (miles)	234.00	90.00	15
7. Pipe Laterals (miles)			175
8. Winter Water Systems (miles)			
9. Collection Features (type)			
10. Delivery Systems (type)			
11. Disposal Facilities (type)			
12. Habitat Replacement (acres)			1,200
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)			17,931
b. Canals (tons/year)			
c. Laterals (tons/year)			15,638
d. Point Sources (tons/year)			
e. Other (tons/year)			
2. Potential/Balance:			
a. On-farm (tons/year)			112,069
b. Canals (tons/year)	29,900	15,300	
c. Laterals (tons/year)	83,200	11,100	84,362
d. Point Sources (tons/year)			
e. Other (tons/year)			
Data Source:	5/86 Ver Memo	5/86 Ver Memo	SCS/CO

		BR Grand Valley Stage Two	BR Grand Valley Stage Two Balance	USDA Grand Valley
		COLORADO	COLORADO	COLORADO
Economic and Financial Analyses				
	Department of the Interior:			
1.	Plan Formulation Costs	164,256	110,744	
2.	Nonsalinity Planning Costs			
3.	Advance Planning Costs:			
	a. Prior to Authorization			
	b. After Authorization			
4.	Nonsalinity Design Costs			
5.	Salinity Const. Costs To Date			
6.	Balance Salinity Const. Costs	123,384,615	70,564,103	
7.	Nonsalinity Construction Costs			
8.	Habitat Replacement Costs	4,940,539	1,828,691	
9.	Salinity IDC:			
	a. Economic	5,440,907	3,033,664	
	b. Financial			
10.	Nonsalinity IDC			
	a. Economic			
	b. Financial			
11.	Salinity OM&R Costs w/o Power	126,224	213,921	
12.	Nonsalinity OM&R w/o Power	46,346	30,577	
13.	Economic Cost of Power			
14.	Financial Cost of Power			
15.	Salinity M & E Costs			
16.	Nonsalinity M & E Costs			
	Department of Agriculture:			
1.	Technical Assistance Costs			20,066,000
2.	M & E Costs			3,396,000
3.	Information and Education Costs			1,667,000
4.	Federal Cost-share Obligations			37,095,000
5.	Federal Const. Cost-share To Date			8,687,246
6.	Balance Federal Const. Cost-share			28,407,754
7.	Local Construction Cost-share			15,882,000
8.	Percent Federal Cost-share:			70
9.	Federal Habitat Costs			
10.	Local Habitat Costs			
11.	Other Local Costs			
12.	Local O&M Costs			530,000
13.	Annual Value of Replacement Costs			583,400
14.	Federal IDC			
	Cost Effectiveness:			
1.	Total Salinity Construction Costs	123,384,615	70,564,103	58,828,000
2.	Advance Planning Costs	0	0	
3.	Habitat Replacement Costs	4,940,539	1,828,691	0
4.	IDC (Economic)	5,440,907	3,033,664	0
5.	Investment Cost	133,766,062	75,426,458	58,828,000
6.	Annual Equivalent Investment Costs	11,724,595	6,611,129	5,156,274
7.	Annual Salinity OM&R Costs	126,224	213,921	583,400
8.	Annual Economic Cost of Power			
9.	Annual M & E Costs			297,659
10.	Annual Habitat OM&R Costs	46,346	30,577	
11.	Annual Salinity Costs	11,897,165	6,855,628	6,037,334
12.	Tons of Salt Removed Annually	113,100	26,400	230,000
13.	Cost Effectiveness - $/ton	105	260	26

	BR Paradox	BR Lower Gunnison Stage One Winter Water	BR Lower Gunnison Stage One Deferred
	COLORADO	COLORADO	COLORADO
Date of Estimate:	10/85	1/86	1/85
Interest Rate:	8.63%	8.63%	8.63%
Estimate Adjustment for 1/87:	101.27%	101.27%	102.56%
1/87 Interest Rate	8.88%	8.88%	8.88%
IDC Adjustment for 1/87:	2.84%	2.84%	2.84%
Project Area			
1. Irrigated Area (total acres)			
2. Potential Participants:			
a. Individuals (number)			
b. Groups (number)			
3. Canals (total miles)			
4. Laterals (total miles)			
5. Point Sources (number)			
6. Other			
Salt Load Contribution			
1. On-farm (tons/year)			
2. Canals (tons/year)			
3. Laterals (tons/year)			
4. Point Sources (tons/year)	205,000		
5. Other (tons/year)		74,000	
Implementation Plan			
1. Construction Start (year)	1986	1989	1990
2. Construction Period (years)	5	3	6
3. Expected Participants:			
a. Individuals (number)			
b. Groups (number)			
4. On-farm Practices:			
a. Treated Area (acres)			
b. Land Leveling (acres)			
c. Sprinkler Systems (acres)			
d. Farm Ditches/Pipelines (miles)			
5. Canal Lining (miles)			58.90
6. Lateral Lining (miles)			195.40
7. Pipe Laterals (miles)			
8. Winter Water Systems (miles)			
9. Collection Features (type)	shallow wells		
10. Delivery Systems (type)	pipeline		
11. Disposal Facilities (type)	deep well inj		
12. Habitat Replacement (acres)			2,100
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)			
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)			
e. Other (tons/year)			
2. Potential/Balance:			
a. On-farm (tons/year)			
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)	180,000		66,500
e. Other (tons/year)		74,000	

Data Source: MPO/PF-65 Preconst Est 1/84 FR/FES

	BR Paradox	BR Lower Gunnison Stage One Winter Water	BR Lower Gunnison Stage One Deferred
	COLORADO	COLORADO	COLORADO
Economic and Financial Analyses			
Department of the Interior:			
1. Plan Formulation Costs			
2. Nonsalinity Planning Costs			
3. Advance Planning Costs:			
a. Prior to Authorization			
b. After Authorization			
4. Nonsalinity Design Costs			
5. Salinity Const. Costs To Date	20,498,690		
6. Balance Salinity Const. Costs	63,790,930	27,732,658	140,205,128
7. Nonsalinity Construction Costs			
8. Habitat Replacement Costs			
9. Salinity IDC:			
a. Economic			
b. Financial			
10. Nonsalinity IDC			
a. Economic			
b. Financial			
11. Salinity OM&R Costs w/o Power	303,797	361,519	
12. Nonsalinity OM&R w/o Power		74,937	67,692
13. Economic Cost of Power	1,017,722		
14. Financial Cost of Power	157,975		
15. Salinity M & E Costs			
16. Nonsalinity M & E Costs			
Department of Agriculture:			
1. Technical Assistance Costs			
2. M & E Costs			
3. Information and Education Costs			
4. Federal Cost-share Obligations			
5. Federal Const. Cost-share To Date			
6. Balance Federal Const. Cost-share			
7. Local Construction Cost-share			
8. Percent Federal Cost-share:			
9. Federal Habitat Costs			
10. Local Habitat Costs			
11. Other Local Costs			
12. Local O&M Costs			
13. Annual Value of Replacement Costs			
14. Federal IDC			
Cost Effectiveness:			
1. Total Salinity Construction Costs	84,289,620	27,732,658	140,205,128
2. Advance Planning Costs			
3. Habitat Replacement Costs			
4. IDC (Economic)			
5. Investment Costs	84,289,620	27,732,658	140,205,128
6. Annual Equivalent Investment Costs	7,387,985	2,430,767	12,288,979
7. Annual Salinity OM&R Costs	303,797	361,519	
8. Annual Economic Cost of Power	1,017,722		
9. Annual M & E Costs			
10. Annual Habitat OM&R Costs			
11. Annual Salinity Costs	8,709,504	2,792,286	12,288,979
12. Tons of Salt Removed Annually	180,000	74,000	66,500
13. Cost Effectiveness - $/ton	48	38	185

	BR Lower Gunnison North Fork	USDA Lower Gunnison 1	USDA Lower Gunnison 2 Montrose
	COLORADO	COLORADO	COLORADO
Date of Estimate:		7/80	7/80
Interest Rate:		0.00%	7.38%
Estimate Adjustment for 1/87:			
1/87 Interest Rate		8.88%	8.88%
IDC Adjustment for 1/87:			0
Project Area			
1. Irrigated Area (total acres)		22,609	32,468
2. Potential Participants:		330	350
a. Individuals (number)		22	310
b. Groups (number)		50	30
3. Canals (total miles)		46	70
4. Laterals (total miles)		0	13
5. Point Sources (number)		0	0
6. Other			0
Salt Load Contribution			
1. On-farm (tons/year)		66,000	76,000
2. Canals (tons/year)		41,400	37,800
3. Laterals (tons/year)		11,400	2,900
4. Point Sources (tons/year)		0	0
5. Other (tons/year)		0	0
Implementation Plan			
1. Construction Start (year)	1990	1989	1991
2. Construction Period (years)	8	18	18
3. Expected Participants:			
a. Individuals (number)		220	230
b. Groups (number)		15	15
4. On-farm Practices:			
a. Treated Area (acres)		20,400	26,000
b. Land Leveling (acres)		8,400	12,000
c. Sprinkler Systems (acres)		2,600	3,700
d. Farm Ditches/Pipelines (miles)		305	440
5. Canal Lining (miles)		40.00	56.00
6. Lateral Lining (miles)		9	3
7. Pipe Laterals (miles)		28	8
8. Winter Water Systems (miles)		0	0
9. Collection Features (type)		0	0
10. Delivery Systems (type)		0	0
11. Disposal Facilities (type)		0	0
12. Habitat Replacement (acres)		950	1,300
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)		0	0
b. Canals (tons/year)		0	0
c. Laterals (tons/year)		0	0
d. Point Sources (tons/year)		0	0
e. Other (tons/year)		0	0
2. Potential/Balance:			
a. On-farm (tons/year)		38,700	48,300
b. Canals (tons/year)		34,000	31,000
c. Laterals (tons/year)		9,400	2,400
d. Point Sources (tons/year)		0	0
e. Other (tons/year)		0	0
Data Source:		SCS/CO	SCS/CO

	BR Lower Gunnison North Fork COLORADO	USDA Lower Gunnison 1 COLORADO	USDA Lower Gunnison 2 Montrose COLORADO
Economic and Financial Analyses			
Department of the Interior:			
1. Plan Formulation Costs			
2. Nonsalinity Planning Costs			
3. Advance Planning Costs:			
a. Prior to Authorization			
b. After Authorization			
4. Nonsalinity Design Costs			
5. Salinity Const. Costs To Date			
6. Balance Salinity Const. Costs			
7. Nonsalinity Construction Costs			
8. Habitat Replacement Costs			
9. Salinity IDC:			
a. Economic			
b. Financial			
10. Nonsalinity IDC			
a. Economic			
b. Financial			
11. Salinity OM&R Costs w/o Power			
12. Nonsalinity OM&R w/o Power			
13. Economic Cost of Power			
14. Financial Cost of Power			
15. Salinity M & E Costs			
16. Nonsalinity M & E Costs			
Department of Agriculture:			
1. Technical Assistance Costs		17,182,000	18,234,000
2. M & E Costs		2,250,000	2,571,000
3. Information and Education Costs		1,648,000	1,854,000
4. Federal Cost-share Obligations		31,752,000	33,696,000
5. Federal Const. Cost-share To Date		0	0
6. Balance Federal Const. Cost-share		31,752,000	33,696,000
7. Local Construction Cost-share		13,608,000	14,441,000
8. Percent Federal Cost-share:		70	70
9. Federal Habitat Costs		0	0
10. Local Habitat Costs		0	0
11. Other Local Costs		0	0
12. Local O&M Costs		453,600	481,500
13. Annual Value of Replacement Costs		499,200	530,000
14. Federal IDC		0	0
Cost Effectiveness:			
1. Total Salinity Construction Costs		50,582,000	53,784,000
2. Advance Planning Costs		0	0
3. Habitat Replacement Costs		0	0
4. IDC (Economic)		0	0
5. Subtotal Investment		50,582,000	53,784,000
6. Annual Equivalent Investment Costs		4,433,512	4,714,168
7. Annual Salinity OM&R Costs		499,200	530,000
8. Annual Economic Cost of Power		0	
9. Annual M & E Costs		197,213	225,348
10. Annual Habitat OM&R Costs		0	0
11. Annual Salinity Costs		5,129,925	5,469,516
12. Tons of Salt Removed Annually		82,100	81,700
13. Cost Effectiveness		62	67

	USDA Lower Gunnison 2 Delta	USDA Lower Gunnison 3	BR Dolores
	COLORADO	COLORADO	COLORADO
Date of Estimate:	7/80	7/80	1/86
Interest Rate:	7.38%	7.38%	8.63%
Estimate Adjustment for 1/87:			101.27%
1/87 Interest Rate	8.88%	8.88%	8.88%
IDC Adjustment for 1/87:	0	0	2.84%
Project Area			
1. Irrigated Area (total acres)	26,667	62,366	
2. Potential Participants:	310	700	
a. Individuals (number)	255	595	
b. Groups (number)	25	60	
3. Canals (total miles)	88	0	
4. Laterals (total miles)	23	0	
5. Point Sources (number)	0	0	
6. Other	0	0	
Salt Load Contribution			
1. On-farm (tons/year)	97,000	32,000	
2. Canals (tons/year)	47,100	0	
3. Laterals (tons/year)	5,300	0	
4. Point Sources (tons/year)	0	0	
5. Other (tons/year)	0	0	
Implementation Plan			
1. Construction Start (year)	1991	1992	1989
2. Construction Period (years)	14	4	3
3. Expected Participants:			
a. Individuals (number)	200	450	
b. Groups (number)	15	30	
4. On-farm Practices:			
a. Treated Area (acres)	21,300	50,000	
b. Land Leveling (acres)	9,900	23,200	
c. Sprinkler Systems (acres)	3,100	0	
d. Farm Ditches/Pipelines (miles)	360	0	
5. Canal Lining (miles)	70	0	
6. Lateral Lining (miles)	4	0	
7. Pipe Laterals (miles)	14	0	
8. Winter Water Systems (miles)	0	0	
9. Collection Features (type)	0	0	
10. Delivery Systems (type)	0	0	
11. Disposal Facilities (type)	0	0	
12. Habitat Replacement (acres)	1,100	500	
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)	0	0	
b. Canals (tons/year)	0	0	
c. Laterals (tons/year)	0	0	
d. Point Sources (tons/year)	0	0	
e. Other (tons/year)	0	0	
2. Potential/Balance:			
a. On-farm (tons/year)	61,600	12,000	
b. Canals (tons/year)	38,700	0	23,000
c. Laterals (tons/year)	4,400	0	
d. Point Sources (tons/year)	0	0	
e. Other (tons/year)	0	0	

1/ Deferred pending identification of beneficial use of water

Data Source:	SCS/CO	SCS/CO	PF-65

	USDA Lower Gunnison 2 Delta COLORADO	USDA Lower Gunnison 3 COLORADO	BR Dolores COLORADO
Economic and Financial Analyses			
Department of the Interior:			
1. Plan Formulation Costs			
2. Nonsalinity Planning Costs			
3. Advance Planning Costs:			
a. Prior to Authorization			
b. After Authorization			
4. Nonsalinity Design Costs			
5. Salinity Const. Costs To Date			
6. Balance Salinity Const. Costs			21,534,177
7. Nonsalinity Construction Costs			
8. Habitat Replacement Costs			
9. Salinity IDC:			
a. Economic			
b. Financial			
10. Nonsalinity IDC			
a. Economic			
b. Financial			
11. Salinity OM&R Costs w/o Power			
12. Nonsalinity OM&R w/o Power			
13. Economic Cost of Power			
14. Financial Cost of Power			
15. Salinity M & E Costs			
16. Nonsalinity M & E Costs			
Department of Agriculture:			
1. Technical Assistance Costs	14,276,000	2,871,000	
2. M & E Costs	1,814,000	482,000	
3. Information and Education Costs	1,236,000	309,000	
4. Federal Cost-share Obligations	26,381,000	5,306,000	
5. Federal Const. Cost-share To Date	0	0	
6. Balance Federal Const. Cost-share	26,381,000	5,306,000	
7. Local Construction Cost-share	11,298,000	2,273,000	
8. Percent Federal Cost-share:	70	70	
9. Federal Habitat Costs	0	0	
10. Local Habitat Costs	0	0	
11. Other Local Costs	0	0	
12. Local O&M Costs	377,100	75,400	
13. Annual Value of Replacement Costs	415,000	83,200	
14. Federal IDC	0	0	
Cost Effectiveness:			
1. Total Salinity Construction Costs	41,893,000	8,486,000	21,534,177
2. Advance Planning Costs	0	0	
3. Habitat Replacement Costs	0	0	
4. IDC (Economic)	0	0	
5. Subtotal Investment	41,893,000	8,486,000	21,534,177
6. Annual Equivalent Investment Costs	3,671,921	743,798	1,887,471
7. Annual Salinity OM&R Costs	415,000	83,200	
8. Annual Economic Cost of Power	0	0	
9. Annual M & E Costs	158,997	42,247	
10. Annual Habitat OM&R Costs	0	0	
11. Annual Salinity Costs	4,245,919	869,245	1,887,471
12. Tons of Salt Removed Annually	104,700	12,000	23,000
13. Cost Effectiveness	41	72	82

	USDA McElmo	BR Glen Oot	USDA Mancos
	COLORADO	COLORADO	COLORADO
Date of Estimate:	7/81	1/83	1/83
Interest Rate:	7.63%	7.88%	7.88%
Estimate Adjustment for 1/87:		105.96%	
1/87 Interest Rate	8.88%	8.88%	8.88%
IDC Adjustment for 1/87:		12.63%	
Project Area			
1. Irrigated Area (total acres)	29,100		9,200
2. Potential Participants:			
a. Individuals (number)	342		95
b. Groups (number)			34
3. Canals (total miles)			104
4. Laterals (total miles)	235		
5. Point Sources (number)			
6. Other			
Salt Load Contribution			
1. On-farm (tons/year)	51,000		13,000
2. Canals (tons/year)			10,000
3. Laterals (tons/year)	9,000		
4. Point Sources (tons/year)		429,000	
5. Other (tons/year)			
Implementation Plan			
1. Construction Start (year)	1990	1/	2005
2. Construction Period (years)	10	3	4
3. Expected Participants:			
a. Individuals (number)	238		57
b. Groups (number)			15
4. On-farm Practices:			
a. Treated Area (acres)	19,700		5,500
b. Land Leveling (acres)			
c. Sprinkler Systems (acres)	19,700		3,200
d. Farm Ditches/Pipelines (miles)	33		
5. Canal Lining (miles)			17
6. Lateral Lining (miles)			
7. Pipe Laterals (miles)	235		
8. Winter Water Systems (miles)			
9. Collection Features (type)		sp boxes & wells	
10. Delivery Systems (type)		pipeline	
11. Disposal Facilities (type)		evap ponds	
12. Habitat Replacement (acres)			
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)			
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)			
e. Other (tons/year)			
2. Potential/Balance:			
a. On-farm (tons/year)	29,000		1,100
b. Canals (tons/year)			7,700
c. Laterals (tons/year)	9,000		
d. Point Sources (tons/year)		287,000	
e. Other (tons/year)			

1/ Deferred pending identification of beneficial use of water

Data Source:	SCS/CO	SCS/CO

	USDA McElmo	BR Glen Dot	USDA Mancos
	COLORADO	COLORADO	COLORADO
Economic and Financial Analyses			
Department of the Interior:			
1. Plan Formulation Costs			
2. Nonsalinity Planning Costs			
3. Advance Planning Costs:			
a. Prior to Authorization			
b. After Authorization			
4. Nonsalinity Design Costs			
5. Salinity Const. Costs To Date			
6. Balance Salinity Const. Costs		327,607,947	
7. Nonsalinity Construction Costs			
8. Habitat Replacement Costs			
9. Salinity IDC:			
a. Economic		20,883,266	
b. Financial			
10. Nonsalinity IDC			
a. Economic			
b. Financial			
11. Salinity OM&R Costs w/o Power		2,778,278	
12. Nonsalinity OM&R w/o Power			
13. Economic Cost of Power			
14. Financial Cost of Power		860,397	
15. Salinity M & E Costs			
16. Nonsalinity M & E Costs			
Department of Agriculture:			
1. Technical Assistance Costs	10,801,000		2,297,000
2. M & E Costs	1,097,000		53,000
3. Information and Education Costs	1,060,000		157,000
4. Federal Cost-share Obligations	18,534,000		3,638,000
5. Federal Const. Cost-share To Date	0		0
6. Balance Federal Const. Cost-share	18,534,000		3,638,000
7. Local Construction Cost-share	9,979,000		2,425,000
8. Percent Federal Cost-share:	65		60
9. Federal Habitat Costs	0		0
10. Local Habitat Costs	0		0
11. Other Local Costs	0		0
12. Local O&M Costs	285,200		61,000
13. Annual Value of Replacement Costs	314,300		66,800
14. Federal IDC	0		0
Cost Effectiveness:			
1. Total Salinity Construction Costs	30,395,000	327,607,947	6,092,000
2. Advance Planning Costs	0		0
3. Habitat Replacement Costs	0		0
4. IDC (Economic)	0	20,883,266	0
5. Subtotal Investment	30,395,000	348,491,213	6,092,000
6. Annual Equivalent Investment Costs	2,664,122	30,545,255	533,964
7. Annual Salinity OM&R Costs	314,300	2,778,278	66,800
8. Annual Economic Cost of Power	0	860,397	0
9. Annual M & E Costs	96,152		4,645
10. Annual Habitat OM&R Costs	0		
11. Annual Salinity Costs	3,074,574	34,183,930	605,409
12. Tons of Salt Removed Annually	38,000	287,000	8,000
13. Cost Effectiveness	81	119	69

	BR Lower Virgin 1/ 2/	USDA Virgin Valley	USDA Moapa
	NEVADA	NEVADA	NEVADA
Date of Estimate:	1/86	7/80	7/80
Interest Rate:	8.63%	7.38%	7.38%
Estimate Adjustment for 1/87:	101.27%		
1/87 Interest Rate	8.88%	8.88%	8.88%
IDC Adjustment for 1/87:	2.84%		
Project Area			
1. Irrigated Area (total acres)		4,625	4,982
2. Potential Participants:			
a. Individuals (number)		45	70
b. Groups (number)		4	1
3. Canals (total miles)		15.70	28.00
4. Laterals (total miles)			
5. Point Sources (number)			
6. Other			
Salt Load Contribution			
1. On-farm (tons/year)		47,200	20,300
2. Canals (tons/year)		8,200	1,850
3. Laterals (tons/year)			
4. Point Sources (tons/year)	359,000		
5. Other (tons/year)			2,000
Implementation Plan			
1. Construction Start (year)	1992	2005	1990
2. Construction Period (years)	3	3	4
3. Expected Participants:			
a. Individuals (number)		45	70
b. Groups (number)		4	1
4. On-farm Practices:			
a. Treated Area (acres)		3,525	4,982
b. Land Leveling (acres)			
c. Sprinkler Systems (acres)			
d. Farm Ditches/Pipelines (miles)		27	14.30
5. Canal Lining (miles)		6.40	0.27
6. Lateral Lining (miles)			
7. Pipe Laterals (miles)			17.80
8. Winter Water Systems (miles)			
9. Collection Features (type)			
10. Delivery Systems (type)	38 mi. pipeline 2/	open lined	pipeline
11. Disposal Facilities (type)			
12. Habitat Replacement (acres)		2,040	2,814
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)			
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)			
e. Other (tons/year)			
2. Potential/Balance:			
a. On-farm (tons/year)		30,407	17,395
b. Canals (tons/year)		6,800	1,835
c. Laterals (tons/year)			
d. Point Sources (tons/year)	22,500 2/		
e. Other (tons/year)			270

1/ Assumes 50% allocation of costs to water supply.

2/ Based on net tons removed at 2460 mg/L. Assuming that w/o project water source is AWT plant, a 1,300 mg/L reduction would occur without the project. With new information (8/87), the cost-effectiveness is approximately $66/ton.

Data Source:	LCR 3/86	SCS/NV	SCS/NV

	BR Lower Virgin	USDA Virgin Valley	USDA Moapa
	NEVADA	NEVADA	NEVADA
Economic and Financial Analyses			
Department of the Interior:			
1. Plan Formulation Costs			
2. Nonsalinity Planning Costs			
3. Advance Planning Costs:			
a. Prior to Authorization			
b. After Authorization			
4. Nonsalinity Design Costs			
5. Salinity Const. Costs To Date			
6. Balance Salinity Const. Costs	19,848,101		
7. Nonsalinity Construction Costs			
8. Habitat Replacement Costs			
9. Salinity IDC:			
a. Economic			
b. Financial			
10. Nonsalinity IDC			
a. Economic			
b. Financial			
11. Salinity OM&R Costs w/o Power	345,873		
12. Nonsalinity OM&R w/o Power			
13. Economic Cost of Power			
14. Financial Cost of Power			
15. Salinity M & E Costs			
16. Nonsalinity M & E Costs			
Department of Agriculture:			
1. Technical Assistance Costs		2,118,000	2,235,600
2. M & E Costs		332,700	399,600
3. Information and Education Costs		206,000	283,200
4. Federal Cost-share Obligations		4,605,000	5,233,000
5. Federal Const. Cost-share To Date		0	0
6. Balance Federal Const. Cost-share		4,605,000	5,233,000
7. Local Construction Cost-share		2,479,000	2,243,000
8. Percent Federal Cost-share:		65	70
9. Federal Habitat Costs		16,900 1/	129,300 1/
10. Local Habitat Costs		9,200 1/	55,400 1/
11. Other Local Costs		0	0
12. Local O&M Costs		64,300	371,600
13. Annual Value of Replacement Costs		142,200	99,000
14. Federal IDC		0	0
Cost Effectiveness:			
1. Total Salinity Construction Costs	19,848,101	6,929,000	7,751,800
2. Advance Planning Costs		0	0
3. Habitat Replacement Costs		16,900	129,300
4. IDC (Economic)	0	0	0
5. Subtotal Investment	19,848,101	6,945,900	7,881,100
6. Annual Equivalent Investment Costs	1,739,686	608,808	690,778
7. Annual Salinity OM&R Costs	345,873	142,200	99,000
8. Annual Economic Cost of Power	0	0	0
9. Annual M & E Costs		29,161	35,025
10. Annual Habitat OM&R Costs			
11. Annual Salinity Costs	2,085,559	780,169	824,803
12. Tons of Salt Removed Annually	22,500	37,287	19,500
13. Cost Effectiveness	93	21	42

1/ These figures are estimates of the voluntary relacement costs.

	BR Las Vegas Wash Stage I Pittman NEVADA	BR Las Vegas Wash Stage I Whitney NEVADA	BR Las Vegas Wash Stage II NEVADA
Date of Estimate:	Complete		
Interest Rate:			
Estimate Adjustment for 1/87:			
1/87 Interest Rate			
IDC Adjustment for 1/87:			
Project Area			
1. Irrigated Area (total acres)			
2. Potential Participants:			
a. Individuals (number)			
b. Groups (number)			
3. Canals (total miles)			
4. Laterals (total miles)			
5. Point Sources (number)			
6. Other			
Salt Load Contribution			
1. On-farm (tons/year)			
2. Canals (tons/year)			
3. Laterals (tons/year)			
4. Point Sources (tons/year)			
5. Other (tons/year)			
Implementation Plan			
1. Construction Start (year)	1984	1986	1992
2. Construction Period (years)	1	3	10
3. Expected Participants:			
a. Individuals (number)			
b. Groups (number)			
4. On-farm Practices:			
a. Treated Area (acres)			
b. Land Leveling (acres)			
c. Sprinkler Systems (acres)			
d. Farm Ditches/Pipelines (miles)			
5. Canal Lining (miles)			
6. Lateral Lining (miles)			
7. Pipe Laterals (miles)			
8. Winter Water Systems (miles)			
9. Collection Features (type)			
10. Delivery Systems (type)			
11. Disposal Facilities (type)			
12. Habitat Replacement (acres)			
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)			
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)	?,000		
e. Other (tons/year)			
2. Potential/Balance:			
a. On-farm (tons/year)			
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)		1,000	66,000
e. Other (tons/year)			
Data Source:	CRWQO	CRWQO	CRWQO

	BR Las Vegas Wash Stage I Pittman NEVADA	BR Las Vegas Wash Stage I Whitney NEVADA	BR Las Vegas Wash Stage II NEVADA
Economic and Financial Analyses			
Department of the Interior:			
1. Plan Formulation Costs			
2. Nonsalinity Planning Costs			
3. Advance Planning Costs:			
a. Prior to Authorization			
b. After Authorization			
4. Nonsalinity Design Costs			
5. Salinity Const. Costs To Date	1,381,800		
6. Balance Salinity Const. Costs		1,400,000	9,609,565
7. Nonsalinity Construction Costs			
8. Habitat Replacement Costs			
9. Salinity IDC:			
a. Economic			
b. Financial			
10. Nonsalinity IDC			
a. Economic			
b. Financial			
11. Salinity OM&R Costs w/o Power	50,000	75,000	300,000
12. Nonsalinity OM&R w/o Power			
13. Economic Cost of Power			
14. Financial Cost of Power			
15. Salinity M & E Costs			
16. Nonsalinity M & E Costs			
Department of Agriculture:			
1. Technical Assistance Costs			
2. M & E Costs			
3. Information and Education Costs			
4. Federal Cost-share Obligations			
5. Federal Const. Cost-share To Date			
6. Balance Federal Const. Cost-share			
7. Local Construction Cost-share			
8. Percent Federal Cost-share:			
9. Federal Habitat Costs			
10. Local Habitat Costs			
11. Other Local Costs			
12. Local O&M Costs			
13. Annual Value of Replacement Costs			
14. Federal IDC			
Cost Effectiveness:			
1. Total Salinity Construction Costs	1,381,800	1,400,000	9,609,565
2. Advance Planning Costs			
3. Habitat Replacement Costs			
4. IDC (Economic)			
5. Subtotal Investment	1,381,800	1,400,000	9,609,565
6. Annual Equivalent Investment Costs	121,115	122,710	842,278
7. Annual Salinity OM&R Costs	50,000	75,000	300,000
8. Annual Economic Cost of Power			
9. Annual M & E Costs			
10. Annual Habitat OM&R Costs			
11. Annual Salinity Costs	171,115	197,710	1,142,278
12. Tons of Salt Removed Annually	7,000	1,000	66,000
13. Cost Effectiveness	24	198	17

	BR San Juan	BR Uinta Stage One	BR Uinta Stage Two
	NEW MEXICO	UTAH	UTAH
Date of Estimate:		1/85	
Interest Rate:		8.63%	
Estimate Adjustment for 1/87:		102.56%	
1/87 Interest Rate		8.88%	
IDC Adjustment for 1/87:		2.84%	
Project Area			
1. Irrigated Area (total acres)		97,447	
2. Potential Participants:			
a. Individuals (number)			
b. Groups (number)			
3. Canals (total miles)			
4. Laterals (total miles)			
5. Point Sources (number)			
6. Other			
Salt Load Contribution			
1. On-farm (tons/year)			
2. Canals (tons/year)			
3. Laterals (tons/year)			
4. Point Sources (tons/year)			
5. Other (tons/year)		450,000	
Implementation Plan			
1. Construction Start (year)		1993	
2. Construction Period (years)		8	
3. Expected Participants:			
a. Individuals (number)			
b. Groups (number)			
4. On-farm Practices:			
a. Treated Area (acres)			
b. Land Leveling (acres)			
c. Sprinkler Systems (acres)			
d. Farm Ditches/Pipelines (miles)			
5. Canal Lining (miles)		43.90	
6. Lateral Lining (miles)		11.60	
7. Pipe Laterals (miles)			
8. Winter Water Systems (miles)			
9. Collection Features (type)			
10. Delivery Systems (type)			
11. Disposal Facilities (type)			
12. Habitat Replacement (acres)			
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)			
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)			
e. Other (tons/year)			
2. Potential/Balance:			
a. On-farm (tons/year)			
b. Canals (tons/year)		25,500	
c. Laterals (tons/year)			
d. Point Sources (tons/year)			
e. Other (tons/year)			

Data Source: 4/86 PR/EIS

	BR San Juan	BR Uinta Stage One	BR Uinta Stage Two
	NEW MEXICO	UTAH	UTAH
Economic and Financial Analyses			
Department of the Interior:			
1. Plan Formulation Costs		2,500,000	
2. Nonsalinity Planning Costs			
3. Advance Planning Costs:			
a. Prior to Authorization		1,200,000	
b. After Authorization			
4. Nonsalinity Design Costs			
5. Salinity Const. Costs To Date			
6. Balance Salinity Const. Costs		21,552,000	
7. Nonsalinity Construction Costs			
8. Habitat Replacement Costs		1,000,000	
9. Salinity IDC:			
a. Economic			
b. Financial			
10. Nonsalinity IDC			
a. Economic			
b. Financial			
11. Salinity OM&R Costs w/o Power		157,800	
12. Nonsalinity OM&R w/o Power		7,300	
13. Economic Cost of Power			
14. Financial Cost of Power			
15. Salinity M & E Costs			
16. Nonsalinity M & E Costs			
Department of Agriculture:			
1. Technical Assistance Costs			
2. M & E Costs			
3. Information and Education Costs			
4. Federal Cost-share Obligations			
5. Federal Const. Cost-share To Date			
6. Balance Federal Const. Cost-share			
7. Local Construction Cost-share			
8. Percent Federal Cost-share:			
9. Federal Habitat Costs			
10. Local Habitat Costs			
11. Other Local Costs			
12. Local O&M Costs			
13. Annual Value of Replacement Costs			
14. Federal IDC			
Cost Effectiveness:			
1. Total Salinity Construction Costs		21,552,000	
2. Advance Planning Costs		1,200,000	
3. Habitat Replacement Costs		1,000,000	
4. IDC (Economic)			
5. Subtotal Investment		23,752,000	
6. Annual Equivalent Investment Costs		2,081,863	
7. Annual Salinity OM&R Costs		157,800	
8. Annual Economic Cost of Power			
9. Annual M & E Costs			
10. Annual Habitat OM&R Costs		7,300	
11. Annual Salinity Costs		2,246,963	
12. Tons of Salt Removed Annually		25,500	
13. Cost Effectiveness		88	

	USDA Uinta 1/	BR/USDA Price-Sn Rfael	USDA Price-Sn Rfael
	UTAH	UTAH	UTAH
Date of Estimate:	7/77	1/86	
Interest Rate:	6.63%	8.63%	
Estimate Adjustment for 1/87:		101.27%	
1/87 Interest Rate	8.88%	8.88%	
IDC Adjustment for 1/87:		2.84%	
Project Area			
1. Irrigated Area (total acres)	205,000		
2. Potential Participants:			
a. Individuals (number)	1,300		
b. Groups (number)	250		
3. Canals (total miles)	576		
4. Laterals (total miles)	859		
5. Point Sources (number)			
6. Other			
Salt Load Contribution			
1. On-farm (tons/year)	175,000		
2. Canals (tons/year)	25,000		
3. Laterals (tons/year)	20,000		
4. Point Sources (tons/year)	45,000		
5. Other (tons/year)	235,000		
Implementation Plan			
1. Construction Start (year)	1980	1992	
2. Construction Period (years)	24	7	
3. Expected Participants:			
a. Individuals (number)	800		
b. Groups (number)	150		
4. On-farm Practices:			
a. Treated Area (acres)	128,100		
b. Land Leveling (acres)	42,800		
c. Sprinkler Systems (acres)	79,400		
d. Farm Ditches/Pipelines (miles)	1,540		
5. Canal Lining (miles)			
6. Lateral Lining (miles)			
7. Pipe Laterals (miles)	306		
8. Winter Water Systems (miles)			
9. Collection Features (type)			
10. Delivery Systems (type)	Pipeline		
11. Disposal Facilities (type)			
12. Habitat Replacement (acres)	4,500		
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)	18,751		
b. Canals (tons/year)			
c. Laterals (tons/year)	3,923		
d. Point Sources (tons/year)			
e. Other (tons/year)			
2. Potential/Balance:			
a. On-farm (tons/year)	63,549		
b. Canals (tons/year)			
c. Laterals (tons/year)	11,977		
d. Point Sources (tons/year)			
e. Other (tons/year)		52,322	

1/ Revised to reflect current studies

Data Source: SCS/UT 3-86 Jt Rpt/Forum

		USDA Uinta UTAH	BR/USDA Price-Sn Rfael UTAH	USDA Price-Sn Rfael UTAH
Economic and Financial Analyses				
	Department of the Interior:			
1.	Plan Formulation Costs			
2.	Nonsalinity Planning Costs			
3.	Advance Planning Costs:			
	a. Prior to Authorization			
	b. After Authorization			
4.	Nonsalinity Design Costs			
5.	Salinity Const. Costs To Date			
6.	Balance Salinity Const. Costs		28,658,228	
7.	Nonsalinity Construction Costs			
8.	Habitat Replacement Costs		112,367	
9.	Salinity IDC:			
	a. Economic		2,615,624	
	b. Financial			
10.	Nonsalinity IDC			
	a. Economic			
	b. Financial			
11.	Salinity OM&R Costs w/o Power		0	
12.	Nonsalinity OM&R w/o Power			
13.	Economic Cost of Power			
14.	Financial Cost of Power			
15.	Salinity M & E Costs			
16.	Nonsalinity M & E Costs			
	Department of Agriculture:			
1.	Technical Assistance Costs	17,210,270		
2.	M & E Costs	3,009,660		
3.	Information and Education Costs	704,520		
4.	Federal Cost-share Obligations	61,326,000	6,538,000	
5.	Federal Const. Cost-share To Date	11,249,921	0	
6.	Balance Federal Const. Cost-share	50,076,079	6,620,759	
7.	Local Construction Cost-share	26,283,000	2,837,468	
8.	Percent Federal Cost-share:	70		
9.	Federal Habitat Costs	456,000	31,032	
10.	Local Habitat Costs	232,500		
11.	Other Local Costs	707,800		
12.	Local O&M Costs	3,225,000		
13.	Annual Value of Replacement Costs	1,041,600	179,706	
14.	Federal IDC	0		
	Cost Effectiveness:			
1.	Total Salinity Construction Costs	79,240,790	35,278,987	
2.	Advance Planning Costs	0		
3.	Habitat Replacement Costs	456,000		
4.	IDC (Economic)	0	2,615,624	
5.	Subtotal Investment	79,696,790	37,894,611	
6.	Annual Equivalent Investment Costs	6,985,424	3,321,463	
7.	Annual Salinity OM&R Costs	1,041,600	179,706	
8.	Annual Economic Cost of Power	0		
9.	Annual M & E Costs	263,797		
10.	Annual Habitat OM&R Costs	0	143,398	
11.	Annual Salinity Costs	8,290,820	3,644,567	
12.	Tons of Salt Removed Annually	98,200	52,322	
13.	Cost Effectiveness	84	70	

	BR Dirty Devil	BR Big Sandy	USDA Big Sandy 1/
	UTAH	WYOMING	WYOMING
Date of Estimate:	1/85		10/84
Interest Rate:	8.63%		7.00%
Estimate Adjustment for 1/87:	102.56%		
1/87 Interest Rate	8.88%		8.88%
IDC Adjustment for 1/87:	2.84%		
Project Area			
1. Irrigated Area (total acres)			15,700
2. Potential Participants:			
a. Individuals (number)			84
b. Groups (number)			9
3. Canals (total miles)			
4. Laterals (total miles)			
5. Point Sources (number)			
6. Other			
Salt Load Contribution			
1. On-farm (tons/year)			90,100
2. Canals (tons/year)			
3. Laterals (tons/year)			
4. Point Sources (tons/year)		164,000	
5. Other (tons/year)	150,000		24,300
Implementation Plan			
1. Construction Start (year)	1991		1989
2. Construction Period (years)	3		8
3. Expected Participants:			
a. Individuals (number)			84
b. Groups (number)			9
4. On-farm Practices:			
a. Treated Area (acres)			15,700
b. Land Leveling (acres)			2,500
c. Sprinkler Systems (acres)			11,000
d. Farm Ditches/Pipelines (miles)			146
5. Canal Lining (miles)			
6. Lateral Lining (miles)			
7. Pipe Laterals (miles)			
8. Winter Water Systems (miles)			
9. Collection Features (type)	shallow wells		
10. Delivery Systems (type)	15000 ft pipeln		
11. Disposal Facilities (type)	injection wells		
12. Habitat Replacement (acres)			1,290
Salt Load Reduction			
1. To date:			
a. On-farm (tons/year)			
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)			
e. Other (tons/year)			
2. Potential/Balance:			
a. On-farm (tons/year)			52,900
b. Canals (tons/year)			
c. Laterals (tons/year)			
d. Point Sources (tons/year)			
e. Other (tons/year)	20,900		

1/ Subject to low pressure sprinkler plan revisions

Data Source: 3/86 Draft PR SCS/WY

		BR Dirty Devil	BR Big Sandy	USDA Big Sandy
		UTAH	WYOMING	WYOMING
Economic and Financial Analyses				
	Department of the Interior:			
1.	Plan Formulation Costs	3,282,051		
2.	Nonsalinity Planning Costs			
3.	Advance Planning Costs:			
	a. Prior to Authorization	974,359		
	b. After Authorization			
4.	Nonsalinity Design Costs			
5.	Salinity Const. Costs To Date			
6.	Balance Salinity Const. Costs	11,076,923		
7.	Nonsalinity Construction Costs			
8.	Habitat Replacement Costs			
9.	Salinity IDC:			
	a. Economic	1,683,394		
	b. Financial			
10.	Nonsalinity IDC			
	a. Economic			
	b. Financial			
11.	Salinity OM&R Costs w/o Power	496,410		
12.	Nonsalinity OM&R w/o Power			
13.	Economic Cost of Power	376,410		
14.	Financial Cost of Power	104,615		
15.	Salinity M & E Costs			
16.	Nonsalinity M & E Costs			
	Department of Agriculture:			
1.	Technical Assistance Costs			2,459,000
2.	M & E Costs			500,000
3.	Information and Education Costs			550,000
4.	Federal Cost-share Obligations			8,151,400
5.	Federal Const. Cost-share To Date			0
6.	Balance Federal Const. Cost-share			8,151,400
7.	Local Construction Cost-share			3,151,400
8.	Percent Federal Cost-share:			70
9.	Federal Habitat Costs			414,700
10.	Local Habitat Costs			177,700
11.	Other Local Costs			2,298,700
12.	Local O&M Costs			300,900
13.	Annual Value of Replacement Costs			375,000
14.	Federal IDC			0
	Cost Effectiveness:			
1.	Total Salinity Construction Costs	11,076,923		11,160,400
2.	Advance Planning Costs	974,359		0
3.	Habitat Replacement Costs			414,700
4.	IDC (Economic)	1,683,394		0
5.	Subtotal Investment	13,734,676		11,575,100
6.	Annual Equivalent Investment Costs	1,203,844		945,647
7.	Annual Salinity OM&R Costs	496,410		375,000
8.	Annual Economic Cost of Power	376,410		0
9.	Annual M & E Costs			43,825
10.	Annual Habitat OM&R Costs			0
11.	Annual Salinity Costs	2,076,665		1,364,472
12.	Tons of Salt Removed Annually	20,900		52,900
13.	Cost Effectiveness	99		26

Appendix B

Salt Load Reduction Objective Estimate
and
Cost Effectiveness Summary

SALT LOAD REDUCTION OBJECTIVE ESTIMATE

Salt load reduction required to maintain the Lower Basin standards was estimated using a 3-step procedure.

1. A 15-trace CRSS simulation was made using the Reclamation demand data base (given in Progress Report 13) and initialized at 1986 conditions. Existing and ongoing salinity control project salt load reductions were included as shown in Table B-1. The simulation period was 1987-2040.

2. CRSS output was used to compute the salt load reduction required to reduce the TDS at Imperial Dam to the standard (879 mg/L). This was done using the future-effects equation for projects above Parker Dam:

$$\Delta TDS = \left[Q_{BP} \frac{L_{AP} - \Delta L}{Q_{AP}} - L_{BP} \right] \frac{k}{Q_I}$$

where: ΔTDS = change in TDS (mg/L) at Imperial Dam
Q_{BP} = discharge (kac. ft) below Parker Dam
L_{AP} = salt load (kton) above Parker Dam
ΔL = change in salt load above Parker Dam
Q_{AP} = adjusted discharge above Parker Dam
L_{BP} = salt load below Parker Dam
k = conversion from ton/ac.ft to mg/L = 735.46
Q_I = discharge at Imperial Dam

The difference between the predicted TDS at Imperial Dam (TDS_I) and the standard was substituted for TDS and the equation was solved for ΔL:

$$\Delta L = L_{AP} - \frac{Q_{AP}}{Q_{BP}} \left[\frac{Q_I \, (TDS_I - 879)}{735.46} + L_{BP} \right]$$

The required salt load reduction, ΔL, was then evaluated for each year of the simulation period using CRSS output values for L_{AP}, Q_{AP}, Q_{BP}, L_{BP}, Q_I, and TDS_I. These values and resultant values are displayed in Table B-2.

3. Computed reductions (ΔL) exhibited significant scatter due to oscillations due to the 5 year increments on which the CRSS output was based. Therefore, a smooth

curve was fit through the data. The best fit was achieved using a logistic growth curve of the form:

$$y = \frac{a}{1 + \exp(b-cx)}$$

The coeffiecients were evaluated using non-linear, least-squares regression with the SPSS (Statistical Package for the Social Sciences) Marquardt method (Robinson, B; 1984; SPSS Program NONLINEAR - Nonlinear Regression; Manual 433, Vogleback Computing Center, Northwestern University). The computed reductions were regressed against sequential year numbers, with year one corresponding to 1996, the first year in which the standard was exceeded. The resultant best fit target values are given in Table B-2 and plotted on Figure B-1.

Table B-1. - Salt Load Reduction from Existing Salinity Control Projects

Project	Reduction (kTon/yr)
Reclamation	
Grand Valley, Stage I	21.90
Meeker Dome	48.00
Las Vegas Wash, Pittman Bypass	7.00
USDA	
Grand Valley	33.57
Uinta Basin	22.67
BLM	7.60
	140.74

Table B-2. CRSS Results and Salt Load Reduction Targets at Imperial Dam

YEAR	TDS AT IMPERIAL (mg/L)	-----DISCHARGE (KACFT)----- ABOVE PARKER	BELOW PARKER	AT IMPERIAL	-----SALT LOAD (KTON)---------- ABOVE PARKER	BELOW PARKER	COMPUTED REDUCTION	BEST FIT TARGET
1987	624.0	11157.4	9144.0	8246.0	8252.8	6763.6	.0	4.6
1988	638.0	12357.4	9746.0	8875.0	9409.3	7420.9	.0	6.2
1989	657.0	11557.3	8817.0	7943.0	8988.6	6857.4	.0	8.3
1990	700.0	10457.3	7903.0	7013.0	8488.6	6415.2	.0	11.1
1991	736.0	9596.8	7180.0	6246.0	8194.6	6130.9	.0	14.9
1992	787.0	9899.0	7353.0	6417.0	9071.8	6738.5	.0	20.0
1993	815.0	10349.0	7889.0	6977.0	9906.3	7551.5	.0	26.7
1994	829.0	9935.7	7333.0	6420.0	9564.7	7059.2	.0	35.6
1995	826.0	10182.4	7562.0	6672.0	9788.4	7269.4	.0	47.3
1996	834.0	10011.2	7400.0	6467.0	9746.3	7204.2	.0	62.7
1997	868.0	9652.6	7294.0	6358.0	9777.8	7388.6	.0	82.7
1998	881.0	10068.0	7774.0	6862.0	10417.7	8044.0	24.2	108.4
1999	876.0	9768.6	7288.0	6375.0	9948.4	7422.2	.0	141.1
2000	870.0	9714.1	7182.0	6259.0	9774.1	7226.3	.0	181.9
2001	872.0	9804.0	7367.0	6401.0	9971.2	7492.6	.0	231.7
2002	910.0	9407.1	7166.0	6197.0	9976.8	7600.0	342.9	290.9
2003	934.0	9500.4	7317.0	6372.0	10372.9	7988.9	618.7	359.4
2004	933.0	9502.9	7085.0	6139.0	10272.3	7658.6	604.6	435.5
2005	924.0	9518.0	7198.0	6274.0	10197.9	7712.2	507.6	517.0
2006	920.0	9968.5	7565.0	6599.0	10734.9	8146.6	484.8	600.7
2007	953.0	9095.3	6851.0	5882.0	10091.3	7601.3	785.7	682.9
2008	970.0	9355.4	7187.0	6242.0	10608.9	8149.9	1005.4	760.2
2009	967.0	9253.1	6928.0	5982.0	10367.1	7762.0	956.0	830.2
2010	938.0	9798.8	7517.0	6593.0	10725.3	8227.8	689.5	891.2
2011	929.0	10094.8	7698.0	6731.0	11035.5	8415.4	600.1	942.7
2012	964.0	9263.4	6989.0	6019.0	10429.0	7868.4	922.0	985.1
2013	988.0	9187.6	7038.0	6092.0	10618.5	8134.1	1178.6	1019.2
2014	984.0	9017.0	6868.0	5921.0	10298.7	7844.2	1109.8	1046.1
2015	964.0	9215.0	7109.0	6185.0	10324.4	7964.8	926.6	1067.0
2016	954.0	9734.4	7468.0	6501.0	10906.3	8367.1	864.1	1083.2
2017	982.0	9267.6	6980.0	6010.0	10647.9	8019.6	1112.5	1095.5
2018	995.0	9588.3	7408.0	6462.0	11212.0	8662.4	1319.2	1104.9
2019	984.0	9126.4	6957.0	6010.0	10436.1	7955.3	1125.6	1112.0
2020	961.0	9183.0	7087.0	6163.0	10263.5	7920.9	890.4	1117.3

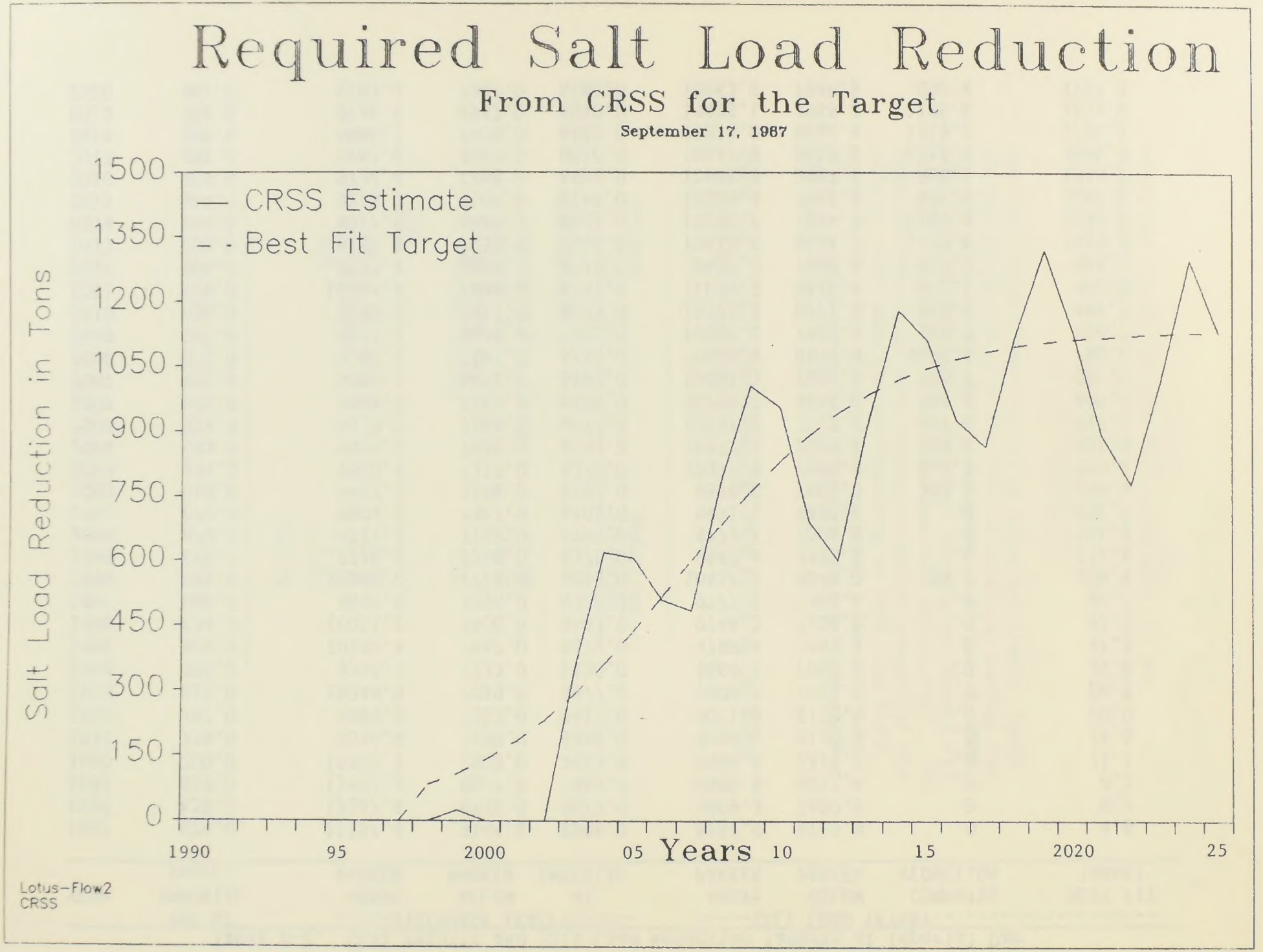


Figure B-1. Required salt load reduction from CRSS for the target objective.

Salinity Control Unit Cost-Effectiveness Summary
With Costs and Interest Rates Adjusted to Same Base

Unit	Potential Salt Reduction (kton/yr)	Salt Reduction to Date (kton/yr)	Cost-effectiveness ($/ton)
Meeker Dome (BR)	48.0	48.0 3/	14
Las Vegas Wash, Stg II (BR)	66.0 2/		17
Virgin Valley (USDA)	37.2		21
Las Vegas Wash, Pittman (BR) 1/	7.0	7.0	24
Big Sandy (USDA)	52.9		26
Grand Valley (USDA)	230.0	33.6	26
Lower Gunnison, WW (BR)	74.0		38
Lower Gunnison 2 Delta (USDA)	104.7		41
Paradox Valley (BR)	180.0		48
Moapa Valley (USDA)	19.5		42
Lower Gunnison 1 (USDA)	82.1		62
Lower Gunnison 2 Montrose (USDA)	81.7		67
Mancos Valley (USDA)	8.8		69
Price-San Rafael Rivers (BR/USDA)	52.3		70
Lower Gunnison 3 (USDA)	12.0		72
McElmo Creek (USDA)	38.0		81
Dolores Project (BR)	23.0		82
Uinta Basin (USDA)	98.2	22.7	84
Uinta Basin Stage I (BR)	25.5		88
Dirty Devil River (BR)	20.9		99
Sinbad Valley (BLM)	7.5		103
Lower Virgin River (BR)	44.1 4/		104
Grand Valley Stage Two (BR)	113.1		105
Glenwood-Dotsero Springs	287.0		119
Grand Valley Stage One (BR)	24.0	21.9	121
Lower Gunnison Stage I Balance (BR)	66.5		185
Las Vegas Wash, Whitney (BR) 1/	1.0 2/		198
Grand Valley Stage Two Balance (BR)	26.4		260
Lower Gunnison N Fork (BR)			
San Juan River (BR)			
Uinta Basin Stage II (BR)			
Big Sandy River (BR)			
PVID (BR/USDA)			

1/ Stage I.
2/ Best estimates at this time.
3/ Cost effectiveness based on 19,000 tons. Almost 29,000 tons were removed prior to salinity control program.
4/ Recent information shows this number to be 48.2 with a cost effectiveness of $66 per ton. The 48,200 tons includes 25,700 tons attributed to AWT flows (Harry Allen's alternative water supply); cost effectiveness is based on a reduction of 22,500 tons.

Appendix C

Least Cost Investment Model
Data and Supplemental Results

Least Cost Investment Model Data

and Supplemental Results

The least cost investment computer model developed by Reclamation and Colorado State University was used to evaluate project investment levels. This model initially determines the optimal combination of projects and construction timing to meet salt load reduction goals at minimum investment levels. The investment level, modified to meet program needs and continuity, results in an investment level for the selected schedule of $560 million.

The model is driven by the overall cost of the total construction and implementation schedule. Cost-effectiveness ($/ton) is an important factor in selecting the projects to implement (as directed in Pulic Law 98-569), but it is not the only consideration in the development of an implementation schedule. The basinwide program must consider the uncertainties of implementation in the technical, social, political, institutional, and legal arenas. Local concerns and needs, management of irrigation systems, and regional impacts are involved in the final selection of an implementation schedule.

Table C-1. Maximum Budget and Salt Load Reduction Targets Used in the Least Cost Investment Model 1/

YEAR	MAXIMUM COST TARGET 2/ (Millions of Dollars)		SALT LOAD REDUCTION
	ANNUAL	CUMULATIVE	TARGET (kTon) 3/
1987	20	40	0
1988	30	70	0
1989	40	110	0
1990	50	150	0
1991	50	190	0
1992	50	230	63
1993	50	270	83
1994	50	310	108
1995	50	350	141
1996	50	390	182
1997	50	430	232
1998	50	470	291
1999	50	510	360
2000	50	550	436
2001	50	590	517
2002	50	630	601
2003	50	670	683
2004	50	710	760
2005	50	750	830
2006	50	790	891
2007	50	830	943
2008	50	830	985
2009	50	830	1019
2010	50	830	1046

1/ All minimum budget targets were zero.
2/ The two columns are independent - $50 million is the annual maximum but cumulative totals do not allow a full $50 million to be added each year.
3/ Targets were computed for Imperial Dam and shifted forward 4 years to allow project impacts to completely pass through Lakes Powell and Mead.

Table C-2 Project Data Used in the Least Cost Investment Model

PROJECT	SALINITY COST		REMAINING CONSTRUCTION PERIOD (Years)	FIXED START (Year)	REMAINING SALT LOAD REDUCTION (kton)	DELAYED IMPACT 1/
	CONSTRUCTION (Total remaining) (millions of dollars)	OM&R (Annual)				
Reclamation						
Grand Valley, Stage II	133.8	0.17	17	1985 2/	113.1	
Grand Valley, balance	75.4	0.21	9		26.4	
Paradox Valley	63.8	0.46	4	1986 2/	180.0	yes
Dolores	21.5	0.00	6	1989	24.5	
Lower Gunnison, Winter Water	27.7	0.36	3	1989	74.0	
Lower Gunnison, Stage I balance	140.2	0.00	6		66.5	
Las Vegas Wash, Whitney	1.4	0.08	2	1986	1.0	
Las Vegas Wash, remaining area	9.6	0.30	10		66.0	
Uinta Basin, Stage I	23.8	0.16	8		25.5	
Dirty Devil	13.7	0.49	3		20.9	yes
Price-San Rafael	37.9	0.00	7		52.3	
Lower Virgin	19.8	0.34	3		44.1 4/	yes
BLM						
Sinbad Valley	7.2	0.06	3		7.5	yes
USDA						
Grand Valley	28.4	0.00	14	1986 2/	196.4	
Uinta Basin	50.1	0.00	17	1986 2/	75.5	
Lower Gunnison 1	31.8	0.00	18		82.1	
Lower Gunnison 2 - Montrose	33.7	0.00	18		81.7	
Lower Gunnison 2 - Delta	26.4	0.00	14		104.7	
Lower Gunnison 3	5.3	0.00	4		12.0	
Moapa Valley	5.2	0.00	4		19.5	
Virgin Valley	4.6	0.00	3		37.2	
McElmo Creek	18.5	0.00	10	1990 3/	38.0	
Mancos Valley	3.6	0.00	4		8.8	
Big Sandy	8.2	0.00	8		52.9	

1/ Projects with delayed impacts must be completely built before any salt load reduction occurs.
2/ Ongoing projects - remaining cost, construction period and salt load reduction are given.
3/ McElmo will start the year following completion of Dolores.
4/ Recent (8/87) information shows this number to be 48.1, including 25,700 tons attributed to AWT flows which would be otherwise used by Nevada Power's Harry Allen.

YEAR	1 Grand Valley Two	2	3 Paradox Valley	4 Dolores	5 Lower Gunn WW	6	7	8 Las Vegas Whitney	9	10 Uinta I	11	12	13 Price-San Rafael	14 Lower Virgin	15	16	17	18	19 Grand Valley USDA	20 Uinta USDA	21 Lower Gunn 1	22 Lower Gunn 2	23 Lower Gunn 2	24 Lower Gunn 3	25 Moapa	26	27 McElmo Creek	28	29	30	31 Big Sandy	SALT RED	SALT TRGT	COST
1987	.01	.00	.26	.00	.00	.00	.00	.47	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.08	.06	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	0.	0.	24.0
1988	.04	.00	.53	.00	.00	.00	.00	***	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.15	.12	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	21.	0.	50.9
1989	.09	.00	.79	.08	.27	.00	.00	***	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.23	.19	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.05	44.	0.	89.8
1990	.16	.00	***	.27	.67	.00	.00	***	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.30	.25	.04	.00	.00	.00	.18	.00	.03	.00	.00	.00	.18	95.	0.	136.0
1991	.23	.00	***	.47	***	.00	.00	***	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.38	.31	.08	.01	.02	.00	.47	.00	.12	.00	.00	.00	.32	350.	0.	171.0
1992	.30	.00	***	.67	***	.00	.00	***	.00	.00	.00	.00	.06	.27	.00	.00	.00	.00	.45	.37	.14	.04	.06	.18	.76	.00	.24	.00	.00	.00	.47	429.	63.	208.3
1993	.37	.00	***	.86	***	.00	.00	***	.00	.05	.00	.00	.22	.67	.00	.00	.00	.00	.53	.43	.21	.08	.13	.47	***	.00	.35	.00	.00	.00	.62	497.	83.	254.5
1994	.44	.00	***	***	***	.00	.00	***	.00	.18	.00	.00	.39	***	.00	.00	.00	.00	.60	.50	.27	.14	.22	.76	***	.00	.47	.00	.00	.00	.76	575.	108.	300.3
1995	.51	.00	***	***	***	.00	.00	***	.00	.32	.00	.00	.55	***	.00	.00	.00	.00	.68	.56	.34	.21	.30	***	***	.00	.59	.00	.00	.00	.91	697.	141.	337.0
1996	.57	.00	***	***	***	.00	.00	***	.00	.47	.00	.00	.72	***	.00	.00	.00	.00	.75	.62	.41	.27	.39	***	***	.00	.71	.00	.00	.00	***	772.	182.	372.0
1997	.64	.00	***	***	***	.00	.00	***	.00	.62	.00	.00	.89	***	.00	.00	.00	.00	.83	.68	.47	.34	.47	***	***	.00	.82	.00	.00	.00	***	840.	232.	406.3
1998	.71	.00	***	***	***	.00	.00	***	.00	.76	.00	.00	***	***	.00	.00	.00	.00	.90	.74	.54	.41	.55	***	***	.00	.94	.00	.00	.00	***	904.	291.	438.3
1999	.78	.00	***	***	***	.00	.00	***	.00	.91	.00	.00	***	***	.00	.00	.00	.00	.97	.80	.60	.47	.64	***	***	.00	***	.00	.00	.00	***	965.	354.	465.0
2000	.85	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	.87	.67	.54	.72	***	***	.00	***	.00	.00	.00	***	1017.	436.	488.0
2001	.92	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	.93	.73	.60	.81	***	***	.00	***	.00	.00	.00	***	1056.	517.	508.3
2002	.98	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	.98	.80	.67	.89	***	***	.00	***	.00	.00	.00	***	1088.	601.	526.7
2003	***	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	***	.86	.73	.97	***	***	.00	***	.00	.00	.00	***	1118.	683.	538.2
2004	***	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	***	.93	.80	***	***	***	.00	***	.00	.00	.00	***	1141.	760.	544.8
2005	***	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	***	.98	.86	***	***	***	.00	***	.00	.00	.00	***	1155.	830.	550.3
2006	***	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	***	***	.93	***	***	***	.00	***	.00	.00	.00	***	1165.	891.	554.6
2007	***	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	***	***	.98	***	***	***	.00	***	.00	.00	.00	***	1171.	943.	558.0
2008	***	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	***	***	***	***	***	***	.00	***	.00	.00	.00	***	1176.	985.	560.2
2009	***	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	***	***	***	***	***	***	.00	***	.00	.00	.00	***	1177.	1019.	561.8
2010	***	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	***	***	***	***	***	***	.00	***	.00	.00	.00	***	1177.	1046.	563.3
2011	***	.00	***	***	***	.00	.00	***	.00	***	.00	.00	***	***	.00	.00	.00	.00	***	***	***	***	***	***	***	.00	***	.00	.00	.00	***	1177.	1067.	564.9

Recommended plan output from Least Cost Investment Model.

April 27, 1987

$ in 1,000		Cost Eff $	Total Federal Costs	Total thru 1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Grand Valley,Co.	Cost Share	26	37,095	12,087	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,008										
c/s rate 70/30	TA		20,066	5,239	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	554	273							
An.T.Reduct-230,000	M&E		3,396	886	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	35							
	Inf.&Ed.		1,667	50	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	42							
Sub Total			62,224	18,262	3,270	3,270	3,270	3,270	3,270	3,270	3,270	3,270	3,270	3,270	3,270	3,270	2,278	1,270	824	350	0	0	0	0	0	0	0
Uinta,Ut	Cost Share	84	61,310	14,646	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	1,680							
c/s rate 70/30	TA'		17,210	3,598	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	352					
An.T.Reduct-98,200	M&E		3,010	679	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134	53					
	Inf.&Ed.		705	20	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	22					
Sub Total			82,235	18,943	3,953	3,953	3,953	3,953	3,953	3,953	3,953	3,953	3,953	3,953	3,953	3,953	3,953	3,953	3,953	2,633	953	427	0	0	0	0	0
McElmo Creek,Co	Cost Share	81	18,534				1,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,534											
c/s rate 65/35	TA		10,801	50	114	400	818	818	818	818	818	818	818	818	818	818	818	818	421								
An.T.Reduct-38,000	M&E		1,097		70	76	76	76	76	76	76	76	76	76	76	76	76	76	39								
	Inf.&Ed.		1,060			80	80	80	80	80	80	80	80	80	80	80	80	80	20								
Sub Total			31,492	50	184	476	894	894	894	894	894	894	894	894	894	894	894	894	460	0	0	0	0	0	0	0	0
Lower Gun #1,Co.	Cost Share	62	31,752			500	1,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	252				
c/s rate 70/30	TA		17,182		314	640	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	622	306		
An.T.Reduct-82,100	M&E		2,250		110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	50		
	Inf.&Ed.		1,648		80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	48		
Sub Total			52,832		424	750	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	1,010	732	356	0	0
Hoapa Valley,Hv.	Cost Share	42	5,233				1,000	2,000	2,000	233																	
c/s rate 70/30	TA		2,236			105	215	300	300	300	300	300	300	116													
An.T.Reduct-19,500	M&E		400		45	45	45	45	45	45	45	45	40														
	Inf.&Ed.		283			32	32	32	32	32	32	32	32	27													
Sub Total			8,152		45	150	260	345	345	345	345	345	340	116	0	0	0	0	0	0	0	0	0	0	0	0	0
Big Sandy,Wy	Cost Share	26	8,565			657	1,063	1,388	1,632	1,551	975	812	487														
c/s rate 70/30	TA		2,459		146	262	327	382	382	240	240	175	175	65	65												
An.T.Reduct-52,900	M&E		500	14	66	60	40	40	40	40	40	40	40	20	20	20	20										
	Inf.&Ed.		550		50	50	50	50	50	50	50	50	50	50	50												
Sub Total			12,074		212	322	367	422	422	280	280	215	215	85	85	20	20	0	0	0	0	0	0	0	0	0	0
Lower Gun #2(MCO),Co.	Cost Share	67	33,696					1,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	696		
c/s rate 70/30	TA		18,234				600	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	534
An.T.Reduct-81,700	M&E		2,571				126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	51
	Inf.&Ed.		1,854				90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	54
Sub Total			56,355				726	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	1,026	585
Lower Gun #2(DCO),Co.	Cost Share	41	26,381					1,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,381						
c/s rate 70/30	TA		14,276				340	680	870	870	870	870	870	870	870	870	870	870	870	870	870	870	870	206			
An.T.Reduct-104700	M&E		1,814				103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	63			
	Inf.&Ed.		1,236				70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	70	46			
Sub Total			43,707				443	783	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	269	0	0	0
Lower Gunnison #3,Co.	Cost Share	72	5,306						1,000	2,000	2,000	306															
c/s rate 70/30	TA		2,871					151	320	450	450	450	450	450	150												
An.T.Reduct-12,000	M&E		482					64	64	64	64	64	64	64	34												
	Inf.&Ed.		309					40	40	40	40	40	40	40	29												
Sub Total			8,968					215	384	514	514	514	514	514	184	0	0	0	0	0	0	0	0	0	0	0	0
Total Cost Share			227,872	26,733	5,000	6,157	9,063	14,388	17,632	16,784	15,975	14,118	13,487	13,000	13,000	12,534	10,008	9,000	9,000	7,680	5,381	4,000	2,252	2,000	696	0	0
Total TA			105,335	8,887	2,354	3,187	4,980	5,911	6,270	6,258	6,258	6,193	6,193	5,899	5,483	5,268	5,268	5,268	4,425	3,723	3,450	3,022	2,670	1,728	1,206	900	534
Total M&E			15,520	1,579	590	590	799	863	863	863	863	863	858	798	768	734	734	714	677	508	473	392	339	299	176	126	51
Total Inf. & Ed.			9,312	70	274	386	546	586	586	586	586	586	586	581	543	464	464	464	404	321	279	262	240	216	138	90	54
Grand Total (Fed. Dollars)		41	358,039	37,269	8,218	10,320	15,388	21,748	25,351	24,491	23,682	21,760	21,124	20,278	19,794	19,000	16,474	15,446	14,506	12,232	9,583	7,676	5,501	4,243	2,216	1,116	639

Appendix D

Repayment Analysis

REPAYMENT ANALYSIS

The basin fund revenues used in this analysis are estimates provided by Western Area Power Administration in late 1986 and verified in late 1987. Payments have been deducted for Hoover deficiencies. The result is revenue available annually for all of the projects required tomeet salt load reduction objectives. Table D-1 shows the repayment dollars available.

Tables D-2 and D-3 show the repayment dollars needed and the repayment capability of the Basin States for the $560 million investment level without and with inflation costs added.

For purposes of basin fund repayment analysis, the USDA costs for technical assistance, education, and monitoring and evaluation are excluded. However, these Federal costs are costs of implementation and are considered in the computed cost-effectiveness values.

One can arrive at the $560 million number by starting with line 73, Total - All Units Cumulative Total, $626,952 and subtracting dollars already spent on the program shown as cumulative subtotal in column F.

Total	$ 626,952
Subtotal PL 93-320 includes Grand Valley, Las Vegas Wash, and Paradox Valley	- 49,978
Subtotal PL 98-569, includes USDA Grand Valley and Uinta Basin	- 19,761
Total remaining costs	$ 557,213
Rounded	$ 560,000

Table D-4 provides a summary from Table D-1, theoretically, of the funds needed for construction for Department of the Interior and US Department of Agriculture. One must remember, though, that funds for USDA technical assistance, education, and monitoring and evaluation must be added to those dollars. And these summary figures are originally derived from the Least Cost Investment Model and construction costs are probably not spread in the way the funds would actually be spent. The table is provided only as a guide to the dollars required.

Table D-1
Colorado River Basin Salinity Control Program
Available Revenue in LCRBD Fund
For Salinity Control Programs
($1,000's)

Year	Hoover Revenue Available	Plus Parker-Davis Revenue Available	Less Hoover Deficiency Payments	Equals Total Revenue Available
1987	3,770	0	0	3,770
1988	10,304	0	1,556	8,749
1989	9,458	0	1,556	7,902
1990	9,336	0	1,556	7,780
1991	9,168	0	1,556	7,613
1992	9,451	0	1,556	7,895
1993	9,120	0	1,556	7,564
1994	9,120	0	1,556	7,564
1995	9,120	0	1,556	7,564
1996	9,120	0	1,556	7,564
1997	9,120	0	1,556	7,564
1998	9,355	0	1,556	7,799
1999	9,132	0	1,556	7,576
2000	9,252	0	1,556	7,696
2001	8,964	0	1,556	7,408
2002	8,917	0	1,556	7,362
2003	9,033	0	1,556	7,477
2004	8,858	0	1,556	7,303
2005	8,942	879	1,556	8,265
2006	8,921	2,637	0	11,559
2007	8,881	2,637	0	11,518
2008	8,670	2,637	0	11,307
2009	8,828	2,637	0	11,465
2010	8,779	2,637	0	11,417
TOTAL	213,618	14,066	28,000	199,684

CRWO1P RECOMMENDED PLAN - MAY 1987/0A5E1987 — $560 Million Alternative - Without Inflation — Repayment Interest Rates - 1985 @ 0.12375, 1986 @ 0.10625, 1987 through 2010 @ 0.07500

CRWO1P Data Table — May 5, 1987

$ in 1,000's P.L.93-320 Units	Total Investment Costs	Investment and O&M Costs	Total thru 1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Grand Valley Stage I	20,056	29,048	28,856			8	8	0	8	0	8	8	8	8	0	8	8	0	0	0	0	0	0	0	0	0	0	0
Grand Valley Stage II	153,071	154,279		3,950	15,355	1,338	4,013	6,680	9,364	9,364	9,364	9,364	9,364	9,364	8,026	9,364	9,364	9,364	9,364	9,364	8,026	2,675	173	173	173	173	173	173
Grand Valley - Balance -	0	0																										
Crystal Geyser	0	0																										
Las Vegas Wash - Pittman -	1,302	2,602	1,302	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Las Vegas Wash - Whitney -	1,400	3,050			370	480	542	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Las Vegas Wash Stage II	0	0																										
Paradox Valley Unit	84,290	93,525	13,390	2,350	4,750	16,506	17,224	16,586	13,396	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462	462
Subtotal P.L.93-320 Units:	268,999	282,504	43,628	6,350	20,542	18,462	21,836	23,407	22,893	9,950	9,950	9,950	9,950	9,950	8,621	9,958	9,958	9,958	9,950	9,950	8,621	3,270	767	767	767	767	767	767
Cumulative Subtotal:			43,628	49,970	70,520	88,981	110,810	134,225	157,117	167,076	177,034	186,992	196,951	206,909	215,530	225,488	235,447	245,405	255,364	265,322	273,943	277,213	277,980	278,748	279,515	280,282	281,050	281,817
LCR0 Fund Share																												
Grand Valley Stage 1						123	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124	124
Grand Valley Stage 11																						651	687	687	687	687	687	687
Grand Valley - Balance -																												
Las Vegas Wash - Pittman -								6	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Las Vegas Wash - Whitney -								6	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Las Vegas Wash Stage II																												
Paradox Valley Unit										358	456	456	456	456	456	456	456	456	456	456	456	456	456	456	456	456	456	456
Subtotal - LCR0 Fund Share			0	0	123	124	136	163	521	619	619	619	619	619	619	619	619	619	619	619	619	1,270	1,306	1,306	1,306	1,306	1,306	1,306
P.L.98-569 Units																												
Grand Valley USOA	37,095		6,000	1,870	641	2,207	2,001	2,207	2,001	2,207	2,001	2,207	2,001	2,207	2,001	2,207	2,001	2,001	850									
Uinta USOA	61,702	61,702	6,689	3,305	1,176	3,032	3,032	3,537	3,032	3,032	3,032	3,032	3,537	3,032	3,032	3,032	3,032	3,032	3,537	3,032	2,527	1,011						
Lower Gunnison - Winter Water -	27,233	34,602						7,488	11,093	9,152	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362	362
Lower Gunnison Stage I	0	0																										
Lower Gunnison - North Fork -	0	0																										
Lower Gunnison 1 USOA	31,752	31,752						318	953	1,270	1,905	2,223	1,905	2,223	2,223	1,905	2,223	1,905	2,223	1,905	2,223	1,905	2,223	1,588	635			
Lower Gunnison 2 Montrose USOA	33,696	33,696								337	1,011	1,348	2,022	2,359	2,022	2,359	2,022	2,359	2,022	2,359	2,022	2,359	2,022	2,359				
Lower Gunnison 2 Delta USOA	26,301	26,301								520	1,055	1,847	2,374	2,110	2,374	2,110	2,110	2,374	2,110	2,374	2,110	2,110	791					
Lower Gunnison 3 USOA	5,306	5,306									955	1,539	1,539	1,273														
Dolores - Salinity Control -	21,534	21,534						1,723	4,891	4,307	4,307	4,091	3,015															
McElmo Creek USOA	18,534	18,534							556	1,668	2,224	2,039	2,224	2,224	2,039	2,039	2,224	1,297										
Big Sandy USOA	8,566	8,566						428	1,114	1,199	1,285	1,285	1,199	1,285	771													
Virgin Valley USOA	0	0																										
Moapa Valley USOA	5,362	5,362							965	1,555	1,555	1,287																
Price USOA	0	0																										
Mancos Valley USOA	0	0																										
Palo Verde Irrig District USOA	0	0																										
Subtotal P.L.98-569 Units	277,741	247,515	12,689	5,255	1,010	5,319	5,033	15,780	23,005	25,334	19,692	21,330	20,128	17,154	14,023	14,093	14,310	12,993	11,448	9,695	9,580	7,410	5,734	3,971	3,355	2,046	1,035	362
Cumulative Subtotal:			12,689	17,944	19,761	25,080	30,113	45,893	69,698	95,032	114,723	136,062	156,239	173,394	188,216	202,310	216,620	229,613	241,061	250,755	260,335	267,745	273,479	277,450	280,805	282,852	283,887	284,249
Subtotal - LCR0 Fund Share						1,482	1,283	4,024	6,070	6,460	5,021	5,441	5,145	4,374	3,700	3,594	3,649	3,313	2,919	2,472	2,443	1,009	1,462	1,013	856	522	264	92
Remaining Units																												
Sinbad Valley (BLM)	0	0																										
Uinta Stage I	22,552	22,508										1,128	2,932	3,157	3,303	3,303	3,157	3,303	2,030	4	4	4	4	4	4	4	4	4
Uinta Stage 11	0	0																										
Dirty Devil	0	0																										
Price-San Rafael (Combined)	37,812	37,812									2,269	6,050	6,428	6,050	6,428	6,428	4,159											
Lower Virgin	19,848	25,382									5,359	7,939	6,550	346	346	346	346	346	346	346	346	346	346	346	346	346	346	346
Palo Verde Irrigation District	0	0																										
Big Sandy	0	0																										
San Juan River	0	0																										
Subtotal Remaining Units	80,212	85,702								0	7,620	15,117	15,910	9,553	10,157	10,157	7,662	3,729	2,376	349	349	349	349	349	349	349	349	349
Cumulative Subtotal:										0	7,620	22,744	38,654	48,207	58,364	68,521	76,183	79,912	82,287	82,637	82,986	83,336	83,685	84,035	84,384	84,734	85,083	85,432
Subtotal - LCR0 Fund Share										0	1,945	3,055	4,057	2,436	2,590	2,590	1,954	951	606	89	89	89	89	89	89	89	89	89
TOTAL - ALL UNITS	626,952	615,881	56,317	11,605	22,359	23,780	26,869	39,187	46,697	35,293	37,270	46,413	46,046	36,666	33,600	34,200	31,931	26,600	23,702	20,002	10,550	11,029	6,851	5,000	4,472	3,163	2,152	1,478
CUMULATIVE TOTAL:			56,317	67,922	90,281	114,061	140,930	180,117	226,815	262,108	299,385	345,798	391,844	428,510	462,110	496,310	528,250	554,929	578,712	598,714	617,264	628,293	635,144	640,232	644,704	647,867	650,020	651,498
TOTAL - LCR0 Fund Share			0	0	0	1,604	1,408	4,160	6,233	6,901	7,585	9,915	9,821	7,429	6,989	6,803	6,222	4,803	4,144	3,180	3,151	2,590	2,021	2,400	2,251	1,917	1,659	1,480
LCR0 Funds			0	0	0	3,770	0,749	7,902	7,780	7,613	7,895	7,564	7,564	7,564	7,564	7,564	7,799	7,576	7,696	7,400	7,362	7,477	7,303	8,265	11,559	11,510	11,307	11,465
Balance			0	0	0	2,166	7,341	3,742	1,547	632	310	(2,351)	(2,257)	135	575	761	1,577	2,693	3,552	4,220	4,211	4,000	4,402	5,857	9,308	9,601	9,640	9,970
Previous Balance			0	0	0	0	2,166	9,507	13,249	14,796	15,420	15,730	13,307	11,130	11,265	11,040	12,602	14,179	16,073	20,424	24,652	20,063	33,743	38,224	44,002	53,309	62,990	72,638
Balance			0	0	0	2,166	9,507	13,249	14,796	15,420	15,730	13,307	11,130	11,265	11,040	12,602	14,179	16,073	20,424	24,652	20,063	33,743	38,224	44,002	53,309	62,990	72,638	82,616
Interest Component			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL - Balance			0	0	0	2,166	9,507	13,249	14,796	15,420	15,730	13,307	11,130	11,265	11,040	12,602	14,179	16,073	20,424	24,652	20,063	33,743	38,224	44,002	53,309	62,990	72,638	82,616

CRWDIP RECOMMENDED PLAN - MAY 1987/0ASE1987 — $560 Million Alt - Inflation Rate 0.053243 — Repayment Interest Rates - 1985 @ 0.12375, 1986 @ 0.10625, 1987 through 2010 @ 0.07500

CRWDIP Data Table — May 5, 1987

$ in 1,000's P.L.93-320 Units	Total Investment Costs	Investment and O&M Costs	Total thru 1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Grand Valley Stage I	20,856	29,247	28,856			0	9	9	10	10	11	12	12	13	13	14	15	16	17	17	18	19	20	21	23	24	25	26	28
Grand Valley Stage II	173,929	242,152			15,355	1,409	4,452	7,015	11,523	12,136	12,703	13,463	14,100	14,935	13,403	16,560	17,450	10,379	19,357	20,380	10,406	6,462	439	462	487	513	540	569	599
Grand Valley - Balance -	0	0																											
Crystal Geyser	0	0																											
Las Vegas Wash - Pittman -	1,382	3,920	1,382	50	50	53	55	58	62	65	68	72	76	80	84	88	93	98	103	109	115	121	127	134	141	149	157	165	174
Las Vegas Wash - Whitney -	1,485	4,991			370	506	601	88	92	97	102	108	114	120	126	133	140	147	155	163	172	181	191	201	212	223	235	247	260
Las Vegas Wash Stage II	0	0																											
Paradox Valley Unit	76,452	113,420	13,390	2,350	4,750	17,469	19,106	19,378	16,485	599	630	664	699	732	776	817	861	906	955	1,005	1,059	1,115	1,175	1,237	1,303	1,373	1,446	1,523	1,604
Subtotal P.L.93-320 Units:	282,104	393,738	43,628	2,400	20,542	19,445	24,223	27,348	28,172	12,907	13,594	14,318	15,001	15,884	14,402	17,620	18,550	19,546	20,587	21,683	19,770	7,899	1,952	2,056	2,166	2,281	2,402	2,530	2,665
Cumulative Subtotal:			43,628	46,028	66,570	86,014	110,230	137,586	165,750	178,665	192,259	206,578	221,650	237,542	252,024	269,644	288,202	307,748	328,335	350,018	369,788	377,687	379,639	381,695	383,860	386,141	388,543	391,074	393,738
LCR0 Fund Share																													
Grand Valley Stage I						124	125	125	125	125	125	125	125	125	125	126	126	126	126	126	127	127	127	127	127	128	128	128	129
Grand Valley Stage II																							1,014	1,107	1,112	1,117	1,123	1,129	1,135
Grand Valley - Balance -																													
Las Vegas Wash - Pittman -								6	10	19	28	28	21	22	23	24	25	26	27	28	29	30	32	33	34	36	37	39	41
Las Vegas Wash - Whitney -								6	25	26	27	28	29	30	32	33	35	36	38	39	41	43	45	47	49	51	54	56	59
Las Vegas Wash Stage II																													
Paradox Valley Unit										395	522	529	536	544	551	560	569	578	588	598	609	620	632	645	658	672	687	702	719
Subtotal - LCR0 Fund Share			0	0	124	125	132	160	565	694	702	712	721	732	742	754	766	778	791	805	820	1,049	1,959	1,901	2,004	2,029	2,054	2,082	
P.L.90-569 Units																													
Grand Valley USDA	50,770	50,770	6,000	1,070	641	2,408	2,220	2,672	2,462	2,964	2,731	3,208	3,030	3,647	3,361	4,046	3,729	3,927	1,723										
Uinta USDA	92,500	92,500	6,609	3,305	1,176	3,193	3,363	4,133	3,731	3,930	4,139	4,359	5,357	4,036	5,093	5,365	5,650	5,951	7,313	6,602	5,794	2,441							
Lower Gunnison - Winter Water -	34,261	49,828						8,749	13,651	11,062	494	520	547	577	607	640	674	710	747	787	829	873	920	969	1,020	1,075	1,132	1,192	1,256
Lower Gunnison Stage I	0	0																											
Lower Gunnison - North Fork -	0	0																											
Lower Gunnison 1 USDA	60,544	60,544						371	1,122	1,646	2,601	3,196	2,805	3,545	3,734	3,321	4,142	3,739	4,595	4,140	5,097	4,602	5,654	4,254	1,792				
Lower Gunnison 2 Montrose USDA	71,275	71,275								432	1,300	1,938	3,862	3,762	3,396	4,123	4,396	3,960	4,076	4,402	5,489	4,003	6,001	5,417	6,657	5,008	2,110		
Lower Gunnison 2 Delta USDA	49,541	49,541								604	1,441	2,655	3,596	3,366	3,989	3,734	3,933	4,660	4,363	5,170	4,840	5,890	2,013						
Lower Gunnison 3 USDA	7,870	7,870									1,304	2,212	2,330	2,031															
Dolores - Salinity Control -	20,950	20,950						2,013	5,035	5,502	5,079	5,003	4,565																
McElmo Creek USDA	29,453	29,453							604	2,162	3,036	2,931	3,360	3,547	3,425	3,607	4,145	2,546										
Big Sandy USDA	12,107	12,107						500	1,370	1,554	1,754	1,847	1,016	2,049	1,295														
Virgin Valley USDA	0	0																											
Moapa Valley USDA	7,177	7,177							1,180	2,016	2,123	1,050																	
Price USDA	0	0																											
Mancos Valley USDA	0	0																											
Palo Verde Irrig District USDA	0	0																											
Subtotal P.L.90-569 Units	444,543	460,110	12,609	5,255	1,010	5,602	5,583	18,437	29,294	32,036	26,001	30,600	30,556	27,361	24,901	24,936	26,660	25,502	23,667	21,109	21,970	17,897	14,580	10,640	9,469	6,082	3,242	1,192	1,256
Cumulative Subtotal:			12,609	17,944	19,761	25,363	30,946	49,383	78,677	111,514	130,395	169,075	199,631	226,992	251,893	276,829	303,497	329,999	352,666	373,775	395,744	413,641	428,229	438,869	448,338	454,421	457,662	458,854	460,110
Subtotal - LCR0 Fund Share						1,428	1,424	4,702	7,470	8,373	6,855	7,823	7,792	6,977	6,350	6,359	6,800	6,503	6,035	5,303	5,602	4,564	3,720	2,713	2,415	1,551	827	304	320
Remaining Units																													
Sinbad Valley (BLM)	0	0																											
Uinta Stage I	39,405	39,585										1,621	4,440	5,036	5,603	5,905	5,004	6,640	4,196	0	8	9	9	10	10	11	11	12	13
Uinta Stage II	0	0																											
Dirty Devil	0	0																											
Price-San Rafael (Combined)	61,103	61,103									3,097	8,699	9,734	9,650	10,799	11,373	7,751												
Lower Virgin	20,650	42,050									7,316	11,415	9,919	552	501	612	645	679	715	753	793	835	880	927	976	1,028	1,083	1,140	1,201
Palo Verde Irrigation District	0	0																											
Big Sandy	0	0																											
San Juan River	0	0																											
Subtotal Remaining Units	129,237	142,737								0	10,413	21,735	24,093	15,237	17,062	17,971	14,279	7,319	4,911	761	801	844	889	936	986	1,039	1,094	1,152	1,214
Cumulative Subtotal:										0	10,413	32,148	56,241	71,478	88,540	106,511	120,790	128,109	133,020	133,781	134,582	135,426	136,315	137,252	138,238	139,277	140,371	141,523	142,737
Subtotal - LCR0 Fund Share										0	2,655	5,542	6,144	3,805	4,351	4,503	3,641	1,866	1,252	194	204	215	227	239	251	265	279	294	309
TOTAL - ALL UNITS	855,803	996,505	56,317	7,655	22,359	25,046	29,006	45,786	57,466	45,743	50,809	66,733	69,730	50,402	56,445	60,527	59,506	52,367	49,164	43,553	42,541	26,640	17,429	13,632	12,621	9,402	6,738	4,875	5,134
CUMULATIVE TOTAL:			56,317	63,972	86,331	111,377	141,104	186,970	244,435	290,179	341,067	407,800	477,530	536,012	592,457	652,984	712,490	764,857	814,021	857,574	900,115	926,754	944,184	957,816	970,437	979,839	986,576	991,451	996,585
TOTAL - LCR0 Fund Share						1,553	1,548	4,830	7,636	8,938	10,204	14,068	14,647	11,504	11,432	11,683	11,195	9,135	8,065	6,360	6,612	5,599	5,796	4,911	4,647	3,020	3,134	2,652	2,711
LCR0 Funds						3,770	8,749	7,902	7,700	7,613	7,895	7,564	7,564	7,564	7,564	7,564	7,799	7,576	7,696	7,400	7,362	7,477	7,303	8,265	11,559	11,510	11,307	11,465	11,417
Balance						2,218	7,200	3,064	142	(1,325)	(2,300)	(6,504)	(7,083)	(4,020)	(3,060)	(4,119)	(3,396)	(1,558)	(369)	1,040	250	1,978	1,507	3,355	6,912	7,698	8,173	8,813	8,706
Previous Balance						0	2,218	9,418	10,982	12,624	11,299	8,991	2,407	(4,941)	(9,633)	(14,513)	(20,030)	(25,103)	(20,746)	(31,300)	(32,529)	(34,162)	(34,705)	(35,680)	(34,758)	(29,935)	(23,905)	(16,912)	(8,706)
Balance						2,218	9,418	12,482	12,624	11,299	8,991	2,407	(4,941)	(9,633)	(14,513)	(20,030)	(25,103)	(20,746)	(31,300)	(32,529)	(34,162)	(34,705)	(35,680)	(34,758)	(29,935)	(23,905)	(16,912)	(8,706)	(0)
Interest Component						0	0	0	0	0	0	0	(345)	(672)	(1,013)	(1,397)	(1,757)	(2,006)	(2,184)	(2,269)	(2,303)	(2,421)	(2,490)	(2,425)	(2,089)	(1,668)	(1,180)	(687)	(0)
TOTAL - Balance						2,218	9,418	12,482	12,624	11,299	8,991	2,407	(4,941)	(9,633)	(14,513)	(20,030)	(25,103)	(20,746)	(31,300)	(32,529)	(34,162)	(34,705)	(35,680)	(34,758)	(29,935)	(23,905)	(16,912)	(8,706)	(0)

Table D-4
Summary of funds needed for construction minus USDA technical assistance, etc.

ANNUAL EXPENDITURES - DECEMBER 1987/BASE1987 - December 4, 1987

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
DOI			20,542	18,462	21,836	32,617	38,077	33,417	22,254	29,528
USDA			1,818	5,319	5,033	6,570	8,620	11,876	15,023	16,885
TOTAL			22,359	23,780	26,869	39,187	46,697	35,293	37,278	46,413